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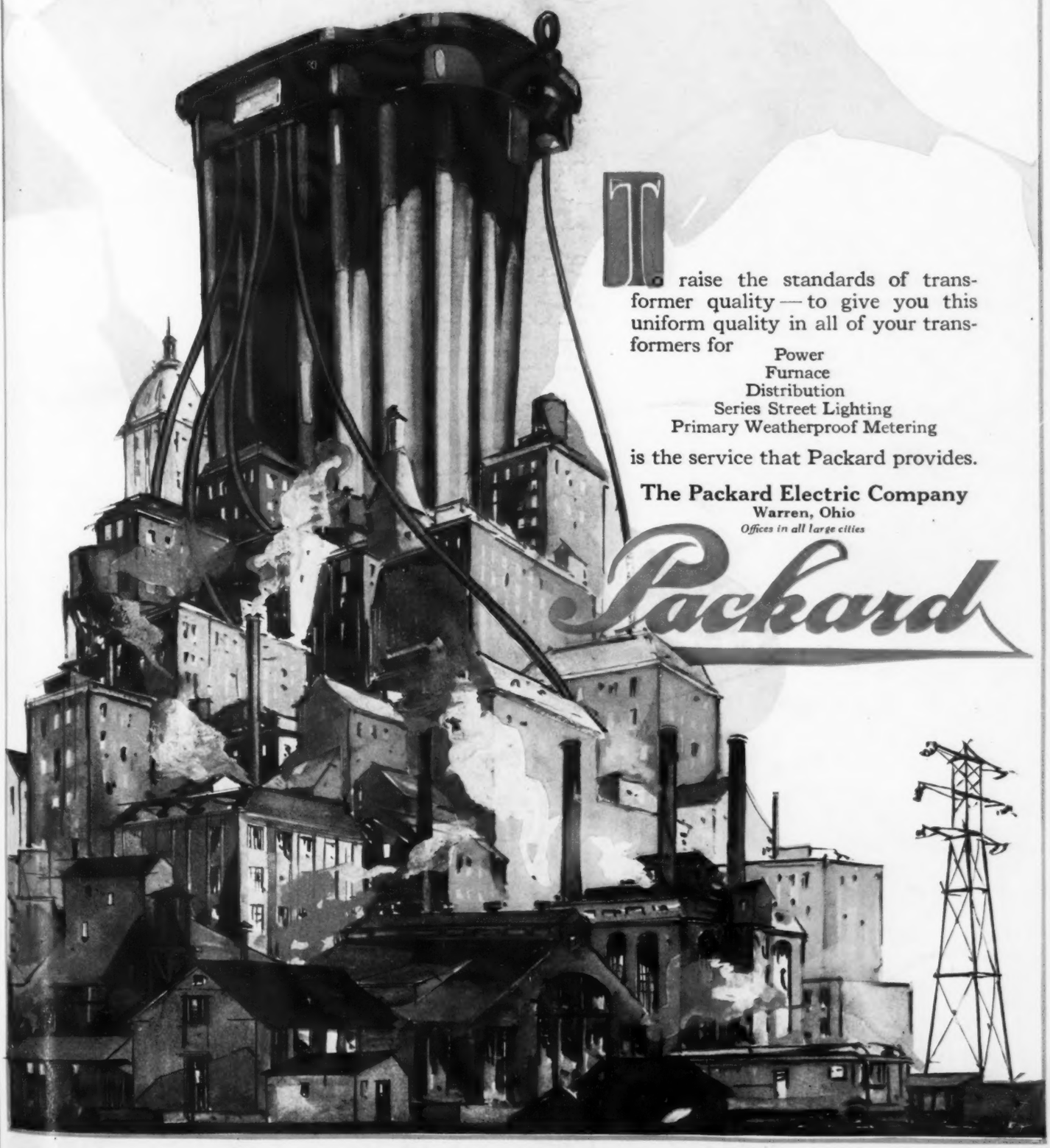
Electrical World

McGraw-Hill Company, Inc. New York, October 7, 1922 Twenty-five Cents a Copy



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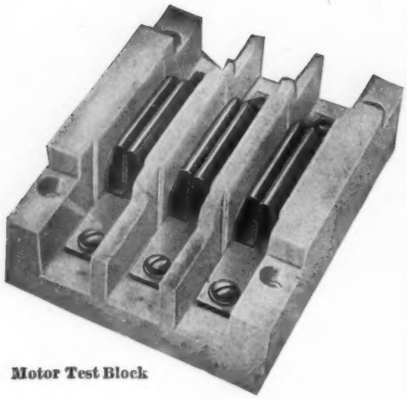

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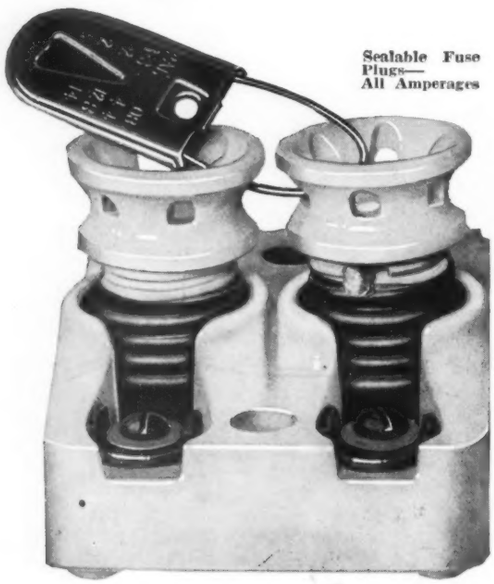

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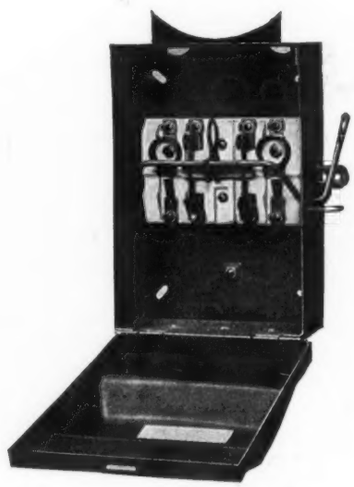

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Electrical World

The consolidation of Electrical World, Electrical Engineer and American Electrician

Published by McGraw-Hill Company, Inc.

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Volume 80 — New York, Saturday, October 7, 1922 — *Number* 15

A Plea for Pride

WE ELECTRICAL men are rendering a tremendous service to mankind. We shall stand in history as benefactors of the race. We are contributing to civilization one of its most priceless possessions. We are enriching our nation. We are bringing new prosperity to our communities and greater happiness to every home.

As a mass, as an industry, we know that this is so. But individually and personally we lack conviction and we take small credit for it. It is a costly weakness in electrical men—understandable, but still a weakness—that is really slowing down the progress of this work of ours.

STUDENTS of ethnology say that there have been ten great fundamental influences that have shaped the evolution of man. First came fire; second, the bow and arrow; third, pottery; fourth, domestic animals; then iron smelting, then writing, then gunpowder, then printing, then steam, then electricity.

In turn each of these great inventions or discoveries has greatly influenced man's mode of living and his thinking. Each has put into operation new forces that have touched life in some vital spot. Following the impulse of the new idea, habits have been changed, hardships have been softened, the mental horizon has been lifted, and life itself has taken on a broader purpose and new meaning. And the greatest and the most far-reaching and beneficent of all these quickening influences is electricity.

For electricity has brought into the world not just a new kind of light and power and heat. These are but the agencies by which it works. Rather, say it has bestowed upon man safety and peace for his cities, infinite relief to his labors, a limitless expansion to his industries, cheer, health and comfort for his home, new ease of transportation, contact with all the world through universal intercommunication—an infinite variety of benefactions within the knowledge and experience of this generation.

ALL this is true. And yet the public little thinks of it, and we electrical men, busy in the day's affairs, also forget that it is so. When we ask for needed higher rates it is with fear and hesitation, and too often when we sell we price our merchandise down low and offer an inducement to the customer to buy what is a vital service.

But the central station needs no apology. It is the great heart of the modern city—vital to its prosperity, its health, its happiness, its very life—a boon to every farm and hamlet. Every community today is just what electricity makes it. And 99 per cent of our central stations have rendered good and honest service.

The electrical man must have more confidence and must take more credit to his industry and to himself before the world. For more frank pride and courage will win a broader recognition and a fuller understanding. And this will bring more rapid progress and greater rewards.

Frank G. Baum

A pioneer in the hydro-electric and transmission developments of the Pacific Coast who is an advocate of high-voltage transmission and super-power systems.

TO BRING the consumer and the producer together is the most important economic problem of the age. Frank G. Baum, consulting engineer of San Francisco, who has achieved more than national distinction in his profession, has made this effort the keynote of his remarkable career. He saw early that the greatest loss in efficiency has been in the step between consumer and producer. He saw that if it were possible to produce, distribute and consume all other products as efficiently and as simply as electricity this loss would be reduced 90 per cent. For this reason the electrical method will always be to him the ideal one, and, in his own words: "Some time in the future a nation's civilization will be measured largely in terms of kilowatt-hours consumed per human being per year, because as the kilowatt-hours consumed are large so the non-productive inefficient labor will be small. Therefore a nation having large natural water powers need never fear decay."

This scientific imagination, which thus visualizes what harnessing water power will do for civilization, informed Mr. Baum's earliest work. After his graduation in 1898 from Stanford University, where with true American spirit he had made his own way, he entered the employ of the Standard Electric Company of California. Here he determined line-charging currents and their reaction for three-phase transmission. On the basis of this and other work the frequency of 60 cycles and the grounded system—now coming to be recognized as standard—were adopted. From 1900 to 1912 he was instructor in electrical engineering at Stanford University, at the same time doing special work in the transmission of electrical energy for the Bay Counties Power Company and other companies. In March, 1902, he became electrical engineer of the California Gas & Electric Corporation. From 1907 to the present Mr. Baum has practiced as a consulting engineer with special reference to hydro-electric power developments.

Besides putting into practical form the type of high-tension oil switches now used by the Pacific Gas & Electric Company and many other companies, Mr. Baum also invented the outdoor high-tension switch which is utilized generally in the Western transmission systems. He was responsible for the first high-head turbine installed in Centerville, the forerunner of all the high-head turbines. To him has been due the development of about 200,000 kw. in water power, most of it in California, some in Alaska and some in South America.

The conception and much of the engineering outline of the Pit River power development of the Pacific Gas & Electric Company are to be credited to Mr. Baum's foresight and sense of hydro-electric possibilities. His is the design of Hat Creek No. 1, Hat Creek No. 2 and Pit River No. 1, the 220,000-volt Pit transmission line and the great Vaca substation at the receiving end. His work during the past two years in developing insulators and regulation systems is outlined in a paper by him, entitled "Voltage Regulation and Insulation of a Large-Power, Long-Distance Transmission System," for which the American Institute of Electrical Engineers awarded its yearly transmission prize for 1921.

Mr. Baum has grasped the importance of linking business enterprise and scientific thinking together for the betterment of social conditions. He has caught the fundamental principle that, as he himself says: "The best control of a utility is that which develops an eagerness and ability on the part of the company to furnish the service and an equal eagerness and ability on the part of the consumer to purchase the service."

Editorial Comment

Electrical World, October 7, 1922

Volume 80 Number 15

The Extravagance of Government Ownership

IT IS doubtful whether people take naturally to government ownership. In most cases they turn to it as the only available means to redress certain wrongs. Possession of a proper historical background, however, would show them the futility of knocking at the door of government for relief, because government is notoriously inefficient, slothful and wasteful. Time has always revealed this condition. No better example of government extravagance and failure need be sought than in the case of our vast war-built merchant fleet. Constructed at enormous cost a few years ago, these boats cannot be disposed of now except at the price of junk. Worse still, the government, in addition to owning the vessels, attempts to operate them through the Shipping Board, and it is costing that board fifty million dollars annually to keep a few boats going, not including interest, full insurance and depreciation on invested capital.

The Shipping Board, of its own volition, has now reached the conclusion that free competition with the privately owned shipping of the world is impossible. "The restrictions of congressional legislation, the demands of varying sections of the country, the limitations on free play from which private business does not suffer," the chairman of the board maintains, offer insuperable obstacles to profitable government operation. Thus does history repeat itself, and another failure is added to the long list of government ventures that have gone wrong.

A Welcome Change of Procedure

IN THE past there has been frequent criticism of the Illuminating Engineering Society for being too scientific and not devoting enough attention to the application of fundamentals to commercial problems. This objection can hardly be raised this year. The papers and discussions were intensely practical; still, the more scientific subjects which must always be the basis of professional society activity were not neglected. The grouping of subjects for discussion was especially commendable since it induced the attendance of practicing engineers and commercial engineers who must be depended upon to put the best thought on illuminating problems into execution. Besides, it brought them into contact with the devotees of science who congregated on the last day of the convention. This intermingling of commercially and scientifically inclined minds cannot help but be beneficial.

Another innovation was the interpretation of every paper by means of the abstract published with it. A continuation of this practice will help to draw hitherto uninterested persons into I. E. S. activities if advance publicity is given to the interpretations through affiliated organizations and if they are emphasized by chairmen in introducing the speakers. Incidentally such treatment may prevent high-class contributions from moldering on library shelves.

Two other lessons might be learned from this and previous conventions. First, the ample material made available through this society should be used more extensively to educate architects, contractors, fixture dealers and the public in the fundamentals of good lighting. Second, renewed attempts should be made to bring about closer co-operation between men of the callings just mentioned and illuminating engineers. The Illuminating Engineering Society, as an organization, may be counted upon to do its part. In addition, individuals must study how they can help—and then do something.

Nonsense About Hydro-Electric Development

FOR years there has been a great deal of nonsense floating around in the non-technical press regarding the possibilities of hydro-electric development. The possibilities are surely big enough without the augmentation of absurd exaggerations. Unfortunately some of the news bulletins issued by central-station agencies occasionally assist in spreading such stories. A recent issue of a holding-company news bulletin, quoting a magazine, makes the assertion that development of hydro-electric resources will not only do away with coal strikes but will also solve the smoke nuisance created by city factories. As a sober fact, there are, of course, sections of the country without large water-power resources, and some form of fuel will be necessary in the production of electrical energy at least until present methods are completely revolutionized. In some sections even those water-power resources in existence are so tied up by other developments, or the value of the property that would be destroyed by overflowing is so great, that development is at present economically out of the question.

The real truth is that water-power resources in some sections of the country can be ultimately developed to conserve fuel resources tremendously. In those sections important developments have already taken place, and additional ones must wait on the further development of industry. In many cases such development means a migration of industry from overcrowded centers in which, for one reason or another, industrial enterprises have concentrated. Such developments mean big things for the country. In other sections the dominating problem is, and probably will be for decades if not centuries to come, the best way in which to make use of fuel resources. Hydro-electric energy is to industry a boon which will grow in magnitude as the problems surrounding its generation and transmission are solved. It will never be a panacea for the industrial ills of the nation.

Coal Situation Will Bear Watching

EVEN though the coal and rail strikes are virtually ended so far as industry is concerned, we are not yet out of the woods. Coal operators complain of car shortage, and abnormal production of fuel will avail industry little if it cannot be moved. The chief concern of the country now is to get coal, and the railroads and coal operators should bend every effort to supply it or be held strictly accountable for neglect of obligation and duty. It will be well also for industry to watch the joint conference of miners and operators now being held in Cleveland.

The coal strike, it must be remembered, although settled for a short time, will break out again next year unless the Cleveland conference adopts an acceptable wage scale binding on both operators and miners. Even then the question will not be definitely settled, for no matter what labor and capital may do at Cleveland, the government fact-finding commission to be appointed by the President has yet to be heard. It is doubtful whether either the miners or the operators look with any favor on government interference, yet a solution which will avoid it is entirely in their own hands.

If wisdom is displayed at the Cleveland conference, the government will have little to redress, but it is questionable whether either the miners or the operators will rise to the opportunity which the situation affords. Uncertainty can be removed only by quick action on the part of the government fact-finding commission. Meanwhile industry must be vigilant, husband its coal supply and add to it constantly whenever and wherever fuel can be obtained at reasonable cost. The coal situation will be critical until next spring.

Interconnection Yields Latent Economies in Operation

OPERATING economies unattainable in individual plants are being realized through the interconnection of steam and hydro-electric stations in many parts of the country. Diversities in loads and variations in stream flow lie at the bottom of these gains. Just how far such economies may be pushed toward their limit remains to be seen, but clearly we are far from the end of this significant movement in power supply and distribution.

The reward of handling interconnections skillfully appears in reduced consumption of fuel, water and labor, in more reliable service and in decreased investment in plant required to handle the electrical needs of a given geographical area. Engineers understand these benefits in general so well that their elaboration is superfluous here. All these economies mean lower cost and better service to the public, whether embodied in reduced reserve capacity, smaller coal or oil costs or quicker installation of power supply in establishments too large for immediate service from strictly local central stations.

The price of real success in interconnection is 100 per cent co-operation between the men and plants involved. Such an organization as the New England System Operators' Club has accomplished much good through development of personal acquaintance and friendship among members formerly known to one another only by telephone, if at all. Such relations among operating men must arise from the desire of executives to play the interconnection game fairly and for the good of all.

A certain amount of give and take must be permitted in handling interconnected plants. Adequate tie lines are imperative, and continuous profound study of operating data, costs and loads is equally important. Upon the ability of system operators to forecast loads and water-supply conditions depends in no small measure the possibility of attaining high efficiency in interplant administration. This integrating of plant economies so as to yield maximum economy over a wide area means lower total costs and hence increased net earnings. There is room for more accurate forecasting in this field and for the improvement of records and interpretations of interconnected plant performance. In a word, if the principles of scientific management are applied still more deeply to interconnection, the results will be most attractive from the standpoints of finance and quality of service.

Three Desirable Qualities in Street Lighting

A STREET-LIGHTING fixture should be inconspicuous by day and sink into its surroundings. No safer rule for selecting standards can be laid down, simply for the reason that in nineteen cases out of twenty there is not enough money available to give the standards such decorative value in themselves as justifies conspicuousness. There are, of course, delightful exceptions to this rule, particularly in the best foreign practice, as witness some exquisitely decorated standards along the Quai de Mont Blanc in Geneva, and for that matter along the Thames Embankment. Generally speaking, rigid economy must be exercised in choosing the fixtures, and the most that one can fairly ask is that results shall be agreeably self-effacing. This furnishes a telling argument against the use of clusters. Were it not from dislike to rub in their failings upon well-meaning communities and those who supply them with light, we should be tempted to publish a series of horrible examples.

In many situations it is desirable to allow a modest amount of light to turn upward so as to show the façades of the buildings. This assumes that the façades are of such character that they deserve to be lighted, which is not always the case. A rule always sound is that the intensity of illumination should be graduated in accordance with the situation, and this, with the present-day equipment of incandescent lamps, is a comparatively simple matter. It is much easier to hold a reasonable spacing and vary the illumination through the size of the lamp than it is to attempt to obtain a similar variation by changing the spacing. Occasionally both size and spacing must be changed, as when lamps are used merely as markers along unfrequented streets. In general terms two or three sizes of lamps are sufficient to give an adequate gradation of illumination on an incandescent circuit, and the usual arrangement of compensators gives facilities for providing sufficient variety of luminous output while retaining conveniently the same standard amperage on the circuit. At present the installation of underground circuits for the street-lighting service is simpler than in the old days, when a somewhat elaborate system of conduits had to be provided. Since the introduction of the steel-armored, lead-covered cable which can be laid in a shallow trench, underground service has been cheapened and simplified so that it is available in many

districts where before overhead wires were a virtual necessity.

With suitably spaced lamps it is often worth while to consider the possibility of dividing the system into two circuits, one operating all night and the other until midnight or 1 o'clock in the morning. If this plan be skillfully worked out, it not only reduces considerably the cost, but it does so in a strictly sensible and logical manner. In other words, it provides illumination which bears some relation to the hours of heavy traffic. Many a street requires the highest grade of lighting until, let us say, after the theater, and from that time on the needs are greatly reduced. In any event the split circuit operated in the way described is a vast improvement over that petty and mean economy, the moonlight schedule.

Will Centralized Motor Control Spread?

LARGE installations of motors for the direct driving of machines in considerable numbers in industrial plants offer unusually good opportunities for engineering study, and recent tendencies toward improved test facilities in the operation of such establishments are very gratifying. These arrangements for both routine and special analyses of power requirements have been pushed far afield in some cases where extreme centralization of circuit and motor control has been adopted. One may soon find power dispatching from a single switchboard a regular practice in industrial circles, including provision for the starting and metering of individual motors from the dispatcher's post. All the machine operator has to do with power supply in such a case is to energize a pilot-lamp signal and to stop his motor when he is through using it, with the usual interim control of speed variations at the machine when required.

When combined with a symmetrical wiring layout, such an installation affords the maximum opportunity for power check-ups in relation to production, opening the door of a second heaven to the cost department. If the instrumental readings and records of such an installation be not only expertly studied but also acted upon, the results in efficiency of motor application should be of surpassing value to both the manufacturing and engineering departments. Since the character of materials worked upon, the type of product manufactured, disposition of machinery to meet different production requirements and the hours of service of particular tools or apparatus are frequently changing in modern industries, such a system of motor control and supervision should cut to the limit lost motion in power applications, reducing energy losses and improving power-factor conditions generally.

Idle motor capacity is one of the banes of the industrial engineer's existence, and any reasonable means of preventing its excessive accumulation deserves thorough study. Restoration of power at individual machines should be greatly hastened in an installation provided with centralized motor control, both in the use of circuit breakers as against fuses and in the forestalling of protracted breakdowns. Of course, a thorough investigation of the economics of centralized motor control should precede its adoption in any plant, for there are many installations in which the refinements it offers may not be worth the investment cost plus the expense of dispatching.

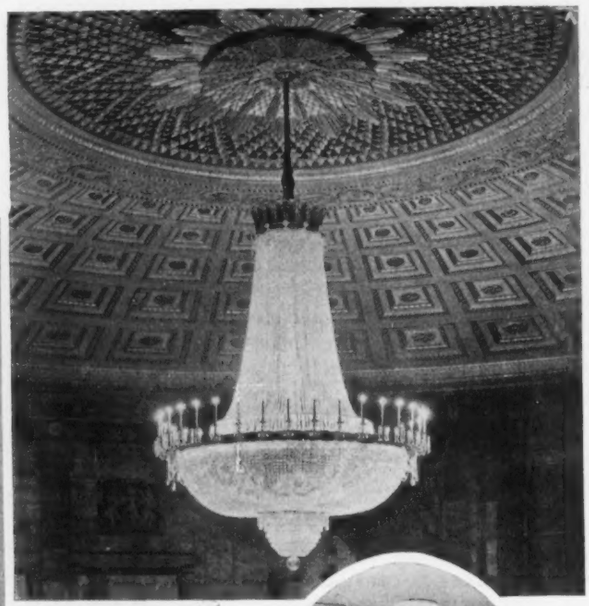
Visible Progress in Central-Station Organization

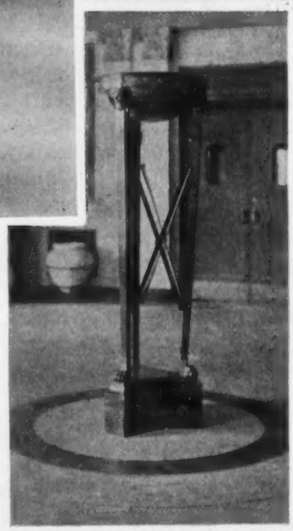
THE recent meeting of the Technical Section of the National Electric Light Association at Milwaukee is a good illustration of the progress of the central-station industry in understanding and handling its problems. There were approximately two hundred men, representing all sections of the country, at the meetings of the eight committees. The decisions taken were necessitated by no sensational development or crisis in the field but covered what may be styled the routine technical business of the association. Ten years ago such a gathering as this would have been impossible. In fact, even the 1915 conference on the National Electrical Safety Code in New York brought together a far less representative group than the Milwaukee meeting. Ten years ago men in the field in many parts of the country had little realization of the national scope of the industry and no thought that the purely local problems of the day were destined to become the national problems of a few years to come. The kind of interest in the work of the National Electric Light Association felt by many individuals was shown in cursing, rather energetically, some of the things that certain committees had done, because these accomplishments, in a back-handed fashion, were used to hit some one over the head. That the work done might have been more satisfactory to them had they themselves taken part in it and brought their point of view to the committees' notice never entered the objectors' heads.

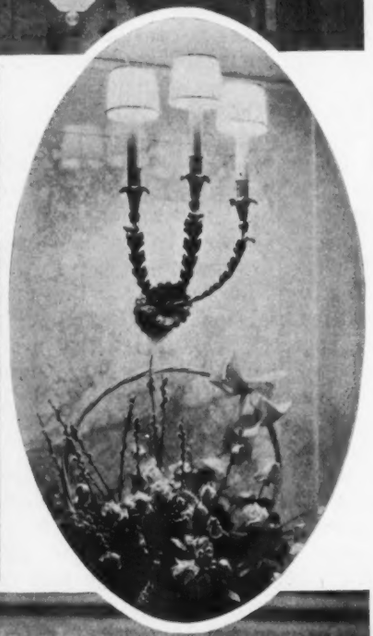
All this is a part of history. Although the results of lack of interest in the past are still in evidence, the problems of today are really being faced in a national way. The organizations needed to deal with them on a country-wide basis are going concerns on a solid foundation. Mention has been made of the Technical Section particularly, because in the past there has been a lack of organization to handle problems adequately as they arose and the work has had to be done in a more or less hit-or-miss fashion. The present organization may not be all that its founders would like to see, but it has already provided a rallying point from which all pressing problems are being met before they get beyond the stage where successful guidance can be given. The same is true of all the other phases of the association work. Those executives who shrink from the expense involved in the attendance of their men at such meetings should remember that the present activities are the result of a situation that threatened more than expense, in that without organization and common study of problems the members of the industry in various sections of the country would be pitted against one another by those whose selfish interests might be opposed.

The significant thing about the work of the association is that its efforts are not restrictive and aimed at monopolistic control, but constructive and so conducted that outsiders not only can be but are invited into the deliberations of many of the committees without any pledges or hints that secrecy is desirable. The self-interest in the work is of that character which seeks to attain its ends by giving others full consideration and a square deal. Self-seeking and narrowness may be encountered here and there, but they are the incidents that normal human nature brings into any activities and are not in control of the work that is being carried on.

Utilitarian and Artistic Illumination in Eastman Theater and Music Hall







ARTIFICIAL illumination is provided not only that people may see but also that the "sights" may be more pleasing. In other words, light may be effectively used as the handmaiden of art in emphasizing decorations, paintings, etc. Moreover, light has a policing function. All of these purposes have been fulfilled in the new five-million-dollar music hall and motion-picture theater which George Eastman has presented to the city of Rochester. Its most notable feature, perhaps, is the showing of pictures in a lighted theater, this being made possible by increased screen illumination and the use of indirect lighting. A novel element is the use of illuminated fish bowls to give diffused light and artistic appearance combined.

I. E. S. Convention Decidedly Practical

By Increasing the Number of Papers on Applied Illuminating Engineering and Interpreting the More Technical Papers a Much Greater Degree of Interest Has Been Stimulated than Formerly Prevailed

WITH an attendance numbering well over 300 and discussions that held the audiences throughout all sessions, the Illuminating Engineering Society had an unusually successful convention last week at Swampscott, Mass. Various members attributed the greatly increased interest to the broader policy displayed in devoting more attention to applications of illuminating engineering fundamentals and in interpreting the highly technical papers.

While it was not brought out in discussion on the convention floor, the opinion was quite generally expressed informally that it is a pity that architects, contractors and fixture dealers cannot be more generally interested in the benefits they can secure from attending the I. E. S. meetings. This situation raised the necessity of renewing efforts at establishing closer contact with these allied interests. Opportunities for spreading the gospel of better lighting were also voiced and suggestions made that some methods of doing so be definitely undertaken.

Of the subjects formally considered on the convention floor, residence and show-window lighting aroused the most discussion, although a variety of other subjects came up for attention. Points brought out by the most practical papers and discussions are recorded below, while papers of a more scientific nature, such as the ones dealing with photometry, will be noticed in the section of the *Electrical World* headed "Digest of Electrical Literature."

Progress in Illumination

A remarkable range and diversity of *materiel* today lie at the base of illuminating engineering practice, declared F. E. Cady in his report as chairman of the committee on progress. The report recounts little revolutionary development in the past year, but it emphasizes an extraordinary wealth in physical resources available both to the scientic investigator and to the engineer specializing in this field. All along the line steps have been taken toward the more efficient application of lighting units and toward better service from available equipment.

In street lighting very encouraging interest has been shown by small cities and towns throughout the Middle West and Southwest in single-lamp ornamental installations. Noteworthy "white way" installations of the year include 336 1,500-cp. units at Salt Lake City, mounted three lamps per pole, with further extensions planned on this line, and others at Seattle, Stamford, Conn., and Portland, Ore. Incandescent street lighting is growing in favor as well. All old gas and arc lamps in East Cleveland, Ohio, have been replaced by gas-filled incandescents, those in the residential district being of the 110-volt multiple type, fed from secondary circuits already serving residential needs.

Floodlighting continues popular in connection with pageants, fairs and other celebrations. Apart from street lighting, floodlighting and sign lighting display the greatest activity since the last report. Sign lighting has assumed such importance that architects are now designing signs in keeping with the rest of the building.

A marked increase is apparent in the number of electric signs using lamps of from 25 watts to even 100 watts rating. Striking effects have been reached by making up letters with 75-watt lamps and filling the border with 25-watt units. In modern sign lighting increased attention is being paid to the clearness and smoothness of the results, and the use of translucent letters instead of exposed lamps is popular.

Higher Intensities in Interior Lighting

A decided trend toward higher intensities is apparent in office building and factory illumination. In an installation of the former type 10 foot-candles was decided upon as the required minimum average intensity, 200-watt lamps being employed for general illumination and 300-watt units for drafting rooms. The effect on factory output of increased illumination has been studied further, and in a noteworthy case outlined production increased 8.5 per cent, the cost of lighting in percentage of factory cost of products increasing from 0.033 to 0.066 per cent. Energy was available at 1.5 cents per kilowatt-hour, and 15 per cent depreciation was allowed on reflector equipment with 6 per cent interest on the investment. The intensity was increased from 3.8 foot-candles to 11.4 foot-candles.

Questions of safety are being considered in relation to illumination. The use of floodlighting in providing concentrated flux upon the working plane where tools are used in locations subject to severe dust conditions appears to be growing in favor.

Zinc white has been found to absorb ultra-violent radiation almost completely. It is suggested that in all cases where it is possible for such radiation to be reflected into the eyes of operators, as in arc welding, the walls and ceiling be painted with this material, known as "Chinese white" with a matte finish. By the use of a specially constructed color filter which transmits only the extreme red and blue-violet, X-ray examination rooms may be lighted.

Figures taken from a survey of 1,500 middle-class urban homes show that the average home has 5.7 rooms with a lamp wattage of 863, an average of two convenience outlets, 1.6 portable lamps and two wall brackets.

Reducing Superfluous Sizes in Fi ture Design

Considerable progress has been made in the line of standardizing certain fixture dimensions. The National Council of Lighting Fixture Manufacturers has practically completed its research work to determine the maximum and minimum allowance for the several dimensions of the "heels" on blown glassware in the 2.25-in. to 8-in. sizes. The tendency is toward the production of a standard holder for each size of glassware. The committee has also been busy on the standardization

of screw threads. In the fixture trade there are about eighty-seven different sizes of threads, pitches, lengths and diameters of screws used. The opportunity for luminaire application is indicated by the estimate that 97 per cent of the electrically lighted homes have luminaires of the direct-lighting type, while only 56 per cent of such luminaires have glassware and 31 per cent have no shades whatever. Reflector designs of late types illustrate varied uses of glassware, mirrors and diffusers for both ornamental and commercial applications, and recent designs of portables exhibit the ingenuity of the bric-à-brac maker.

Tests have been made in Germany lately on the materials used in making globes, reflectors and shades for lighting service. The tests included the effect of heating to 150 deg. C. for two minutes in an oil bath followed by a one-minute cooling in a water bath at 10 deg. C. The transmission of various kinds of glass was determined, and it showed for simple lamp glass of 1.6 mm. to 2.2 mm. thickness 90 per cent; for ornamental glass, 3 mm. to 6 mm. thickness, 56 to 75 per cent; for diagonal rippled glass, 5.6 mm. to 5.9 mm. thickness, 67 per cent; for cathedral glass, 3 mm. to 3.7 mm. thickness, 90 per cent.

Present practice is in the direction of non-ventilated units in the inclosing globes and fixtures used with high-wattage lamps, because of the protection from dust and possibility of more attractive design.

Fewer Lamp Voltages in Demand

Of all the lamps produced in 1921, 87.2 per cent fell within the standard range of 110, 115 and 120 volts, as compared with 81.2 per cent the previous year. Only 3.6 per cent of last year's total sales were carbon incandescents as against 4.3 per cent in 1920. The distribution of tungsten lamps according to size and types shows 79.4 per cent for vacuum lamps and 20.6 per cent for gas-filled, and the average lumens per watt shows an increase from 10.6 to 11. The 40-watt vacuum tungsten lamp appears most popular in North America.

New mill-type lamps in tipless bulbs were listed last fall. A movement is now afoot to reduce the number of kinds of lamps used for train-lighting purposes in passenger service. Lamps of 30 volts to 34 volts rating and of 15, 25, 50 and 75-watt size have been recommended by the committee on train-lighting equipment of the Association of Railway Electrical Engineers.

In the past year there has been a marked growth in the use of the neon vapor-tube lamp, especially in the low candle-power sizes. This development has been rapid for both lighting and sign applications. In the former case one electrode takes the shape of an open-type wire spiral. In the sign lamps one electrode is a metal plate in the form of a letter of the alphabet. The lamps are designed for both alternating and direct current on 200-volt and 250-volt circuits. Some manufacturers guarantee 2,500 hours' life.

Arc-Lamp Developments

The Beck searchlight arc has been improved of late by reduction in the diameters of electrodes. A 225-amp. size lately developed is reported to have a surface brightness of 1,250 hefner-candles per square millimeter, which is seven times that of the ordinary arc and about the same as the Lummer high-pressure (6-atmosphere) arc. A recently produced tungsten arc is provided with a funnel-shaped screen on which the evaporated and sputtered tungsten is deposited to prevent tube blackening. The arc discharge takes place between small tungsten spheres in an atmosphere of rare gas. The lamp is available in small sizes and the spheres are about 1 mm. in diameter in the 1-amp. unit. They can be used for projection purposes and are designed for 200 volts on alternating-current circuits. A new tungsten arc has been reported in Holland which is designed for 220-volt alternating-current service at 50 cycles, giving 1.5 candles with an energy consumption of only 3 watts.

Progress in projection lamps includes a new flash-lamp provided with three lamps for independent or other operation in signal service, etc.; improved spotlamp equipment for show-window illumination, new designs of automobile parking lamps and headlamps featuring accessibility of parts, portable arc-lighting equipment for motion-picture news-reel work, more varied types of traffic signals, and modified optical projection equipment in which the real image of the light source is placed at the first lens focus. The last permits of the employment of as many sources as desired, with the use of elliptic mirrors, and yields the advantages of a more solid source as well as considerable additional intensity.

The report of this committee drew forth little but commendation. The point was made that there should be more uniformity in referring to effectiveness of lighting. For street lighting it is important to know the average and minimum foot-candles illumination on the street surface.

A Survey of Residence Lighting

Two excellent papers surveying the status of residence lighting and outlining the opportunities for development were presented by M. Luckiesh and N. D. Macdonald, the former collecting information by questionnaire and the latter by means of surveyors.

Rented homes, in the opinion of M. Luckiesh, are more deficient than owned homes in all details of wiring, wattage, fixtures, portables, convenience outlets, etc. This conclusion was based upon a very elaborate survey of about 1,500 representative homes in various cities. All items except ceiling fixtures are less than 50 per cent of what they should be to give convenient, proper and adequate lighting in the middle-class home today. The deficiency in wiring is chiefly found in convenience outlets and outlets for brackets. The deficiency in lighting equipment is chiefly found in the cases of shades, wall brackets and portables. In general the watts per socket should be increased somewhat, but the chief need is increase in the number of sockets. From 12 to 38 per cent of the wall brackets, depending upon the room, were found without shades, and 7 to 21 per cent of the ceiling fixtures had no shade.

Wall brackets are much less plentiful than they should be, an increase of 250 per cent appearing justifiable. Considering the advantages of the portable brackets, their number is much less than it should be, and an increase of 400 per cent would be desirable. The well-known scarcity of convenience outlets is verified, an increase of 250 per cent being called for.

One-half the population of this country live in places with more than 2,500 inhabitants, according to Mr. Luckiesh, and only one-half of the homes within easy reach of electric service are wired; one-half the homes wired are rented; the middle-class home is less than half lighted, and the lower-class home is only half as well lighted as the middle-class home.

The survey reported by Mr. Macdonald was made for

the Association of Edison Illuminating Companies and covered 1,500 central-station customers equally distributed among six electric service companies. It was found that the rooms in general are illuminated in spots, but the watts per square foot indicate that the general illumination is low, although the most used portions of the rooms are fairly well illuminated. The customer selects home decorations from the viewpoint of custom or appearance and pays relatively little attention to their influence upon illumination. He has far too few convenience outlets and therefore uses drop cords for table lamps and appliances. He needs 4 per cent more lamps at once to replace outages and has not been taught the value of keeping spare lamps on hand. He has abandoned 11 per cent of his original installation as unsatisfactory or superfluous.

Owing to height or inconvenience, he has trouble in replacing 25 per cent of his bulbs. He needs to be taught the value of light-reflecting decorations and that his lighting appliances need to be cleaned as often as his windows. Last, and most important, he is unadvised of the advances in lighting practice. A rough estimate would indicate that less than 10 per cent of the luminaires reflect modern engineering thought. This is further emphasized by the fact that in living rooms 50 per cent of the lamps are so placed that bare lamps are in the line of vision, and in 33 per cent of these rooms portable lamps have been introduced to improve the original installation.

A big opportunity for service will be lost if a channel is not soon found through which the residence consumer may be impressed with the need for better lighting conditions and the need for proper advice in securing them, declared Mr. Macdonald.

Considerable interest was shown in residence lighting. George H. Stickney expressed the belief that Dr. Luckiesh assumed the existence of too many portable lamps in the average home, but Dr. Luckiesh pointed out that these furnish one of the most desirable forms of lighting and had consequently been chosen in place of ceiling and bracket fixtures for some rooms. E. D. Tillson and others suggested giving vigorous backing to portables as being one of the best means of residence lighting.

R. S. Hale declared that the reason there are so few convenience outlets in residences is that too narrow an interpretation is put on the National Electrical Code by inspectors. If they can be educated and the revisers of the code can be induced to remove ambiguities now hampering development, two big obstacles will be removed.

Louis Bell contended that the most abominable lighting which has ever been experienced will result if great caution is not exercised in applying gas-filled lamps to residence lighting. To avoid this trouble Dr. Luckiesh declared that it would be necessary to conceal the lamps with heavier glass shades.

O. R. Hogue referred to the popular lectures on lighting subjects which are being made in Chicago, the demonstration equipment being carried around on trucks. He also outlined the "more and better business movement" of the National Electric Light Association, which is planned as a continuous concerted drive of all branches of the industry to electrify America. He referred to the clearing house afforded at N. E. L. A. headquarters, the publicity work which the Society for Electrical Development can do, the part of contractors and jobbers, and plans for national advertising.

A residence-lighting bulletin that can be distributed among the public by central stations, manufacturers and dealers was proposed by S. G. Hibben, chairman of the residence-lighting bulletin committee.

Application of Illuminating Principles in School Lighting

The lighting of many school buildings is far below the standards prevailing in commercial and industrial establishments, Henry B. Dates asserted.

Recognizing the seriousness of the situation, the city of Cleveland engaged Professor Dates to make a survey of 123 schools in that city. One school that was typical of the general conditions to be met was selected as a working laboratory. Many types of units were installed, four and six outlets per room, and thoroughly tested for various factors, such as brightness, quality, glare and distribution of light. This study led to the adoption by the Cleveland board of specifications of standard layouts for the public schools. These specifications as well as some for inclosing globes of diffusing glass were included in a paper by Professor Dates. Among the data presented the most important showed the average maximum and minimum intensities and watts per square foot with various sizes of lamps, numbers of units and prices of glassware.

The desirability of providing unsymmetrical layouts of lighting units in some cases to take care of uneven distribution upon desks near the wall was emphasized in the discussion. In a 28-ft. x 30-ft. room six units are ordinarily considered sufficient. A totally inclosing globe was favored on account of the reduced maintenance cost. D. H. Tuck, New York, felt that too much emphasis is placed on brightness and not enough consideration given to glare.

Drawing Power of Show Windows

Good returns in popular interest result from increasing the intensity and quality of show-window lighting, Walter Sturrock and J. M. Shute declared in a paper on that subject. It was found that displays of goods must be changed every few days in order to attract interest, apart from the quality of the lighting. The tests showed that by raising the level of illumination from a plane of 15 foot-candles to about 100 foot-candles there was an increase of 48 to 78 per cent in the number of persons who viewed the displays in Cleveland and Newark stores respectively. The use of colored light and spotlights increased the popularity factor or drawing power substantially. As compared with 15 foot-candles, the drawing power of certain windows tested was increased 35 per cent by the use of 40 foot-candles and 73 per cent by the use of 100 foot-candles. At the same wattage the use of colored light increased the drawing power about 40 per cent.

Experiments have shown that the reflection in plate-glass show windows made by a bright sky or outside objects can be overcome by lighting displays at 1,000 to 2,000 foot-candles, according to Ward Harrison and H. T. Spaulding. Special lighting equipment for furnishing this intensity, involving high-power spotlights, was described by the authors.

In the discussion of these two papers, J. Daniels, Boston, cited a 45 per cent increase in drawing power in a show window equipped with twenty 150-watt type C lamps in modern reflectors as against one having twenty 50-watt lamps in old-style reflectors. A. L. Powell, Harrison, N. J., pointed out that in overcoming

daylight reflection objects to be displayed must be light in color and have good reflecting capacities. Norman Macbeth, New York, predicted an extension of spotlighting in window displays in the next two years.

W. D'A. Ryan, Schenectady, said that in the next few years window illumination should average at least 100 foot-candles. The later the hour, the greater the drawing power of well-lighted windows. Plate glass of small curvature does not yield the results in reducing reflection that come with larger curvature. In some cases the addition of 250 foot-candles of artificial light compensates for the darkening effect of the glass, viewed from outside the window.

Relative Cost of Daylight and Artificial Light

The initial net cost of equipment for natural lighting is 80 to 225 per cent that of electric lighting, and the annual cost for natural lighting is 95 per cent to 135 per cent that of electric lighting, depending upon the nature of the interior illuminated and the work carried on therein, according to detailed estimates presented by M. Luckiesh and L. L. Holladay. The initial net cost for equipment for natural lighting was assumed to include the different costs of the building with and without windows and skylights, the cost of the ground area occupied by light courts and the cost of extra heating systems to supply the difference in heat losses from windows and skylights and from the wall replaced by glass areas. The annual cost of natural lighting is assumed to include interest on the net cost, depreciation, cost of repairs, washing and extra fuel. A number of other factors which have made natural lighting appear still more costly have been omitted so that the conclusions could be based on the major factors only.

For dwellings the initial net cost of natural lighting was found to be 110 per cent to 225 per cent that of electric lighting; for apartments and hotels, 100 per cent to 140 per cent; for offices, about 160 per cent, and for art galleries, 80 per cent to 180 per cent. The annual cost of natural lighting was found to be 95 per cent to 125 per cent that of electric lighting in dwellings, 50 per cent to 100 per cent in apartments, hotels and offices where artificial lighting is used freely, and about 135 per cent in art galleries.

In the discussion which followed the paper the point was made that the authors did not desire to depreciate the value of daylight, but felt that the figures presented showed the advisability of increasing the amount of artificial illumination in many cases where the cost of daylight would be insufficiently low to preclude such investment. The point was made that in silk mills the spoilage item from exposure of material to daylight for protracted periods may be considerable as compared with artificial illumination.

Lighting the Food Industries

Lighting men have found that proper illumination is a very important factor in maintaining sanitary conditions; still, an investigation by W. H. Rademacher, Edison Lamps Works, disclosed the fact that this important factor is to some extent overlooked in plant management. Inadequate lighting exists in a large percentage of the plants allied to the food industry.

In discussing the lighting requirements the following points were included: General character of building, analysis of the processes of manufacture, present lighting practice, recommended practice as to intensity, type of equipment, method of lighting and special or peculiar lighting requirements.

Other uses for artificial lighting in the food industries, the interest-stimulating effect of lighting investigations; and the necessity of dustproof fixtures with large radiating surfaces in grain elevators were emphasized in the discussion by Norman Macbeth, George H. Stickney and C. S. Fox respectively.

Office Lighting

"Office Lighting from the Viewpoint of Hygiene" was the topic of a paper presented by Dr. A. B. Emmons, 2d, Boston, of the Harvard Medical School Department of Industrial Hygiene. Dr. Emmons pointed out that twenty-five stores recently requested the co-operation of the department in studying the working conditions of their employees, these stores being mainly in Boston but also in points as far distant as Cleveland and Washington. The investigation of the illumination aspects of the problem is proceeding along the line of informing the office manager how to obtain proper lighting.

The speaker recommended paying more attention to the use of daylight, the location of offices on upper floors, the use of sawtooth roofs, the prevention of glare from desk tops by the use of green linoleum, and to ventilation through transoms. Poor lighting tends to affect posture adversely, as does poor seeing power. A minimum of 5 foot-candles was recommended by the speaker for office lighting.

Maximum co-operation with the medical profession was urged by G. H. Stickney in commenting upon Dr. Emmons' paper.

Motion Picture Studio Lighting

Following the presentation of a paper on motion picture studio lighting by F. S. Mills, the trend toward the use of panchromatic films with incandescent lamps of high power was cited as a means of obtaining greatly improved illuminating effects. The concentration of heat in such cases is relieved by the use of indirect lighting by large mirrors.

Motor Vehicle Lighting

The principal work of the committee on motor-vehicle lighting, Clayton H. Sharp chairman, during the past year has been the revision of rules governing headlighting devices. The major change has been an increase in allowable intensity, it being pointed out that it is just as important for a driver to see the road ahead properly as it is to avoid glare. The revised rules have been adopted by Massachusetts and unanimously accepted by the Conference of Motor Vehicle Administrators.

L. C. Porter and E. C. Crittenden emphasized the need of educating the public in the proper use of headlamps.

Owing to the prevalence of color blindness, Ward Harrison raised the question whether it would not be advisable to have distinctive shapes as well as colors for traffic signals.

Lighting of Eating Places

Commenting on the paper presented by J. L. Stair on lighting eating places, A. L. Powell said that it should be of great value to architects in laying out work. The speaker referred to the use of inverted RLM reflectors of the dome type in color lighting at Association Island this summer. Red, green and yellow lamps were installed and skirts of cheesecloth provided

for the reflectors, with the result that successive waves of color were gradually transferred back and forth across the ceiling with most pleasing results. Small colored table lamps completed the display, which was inexpensive and attractive.

Influence of Daylight Illumination on Energy Used for Artificial Lighting

With sudden darkening due to clouds or the approach of a shower a heavy load is thrown on the electric service system, causing a relatively unexpected peak. To take care of these emergencies requires very prompt action on the part of the central stations to get the additional generating capacity on the system and oftentimes causes the use of expensive storage batteries, banking or forcing of boilers, and sometimes the floating of additional generating capacities on a line to absorb the peak. The necessity of such precautions can be greatly minimized, A. Smirnoff, Potomac Electric Power Company, declared if automatic devices indicating daylight illumination are installed at what might be called strategic points in the surrounding country to warn the operators of the expected load as well as the possible magnitude. The light intensity or "psychological darkness" at which consumers begin to turn on lamps at a surprisingly rapid rate is found to be approximately 1,500 foot-candles in the open air, according to some elaborate investigations which the author has made.

Outline of Code of Luminaire Design Available for Criticism

A tentative draft of a code of luminaire design was presented by the committee appointed to co-operate with fixture manufacturers (M. Luckiesh chairman). This draft will be submitted to interested persons for criticisms and suggestions before the council of the Illuminating Engineering Society considers it for approval. The outline is about forty pages long and includes discussions on the purpose of a luminaire; characteristics of media; shading reflection, regular reflection, diffuse reflection, mixed reflection, spread reflection, diffusion, refraction, total internal reflection, various phases of design such as light distribution, shape and distribution, shape and efficiency, size of luminaire and light sources; ventilation and radiation, maintenance, construction details of luminaires, and definitions.

In presenting this report Dr. Luckiesh called attention to the importance of installation methods in securing proper illumination. Because of the importance of the luminaire code, P. S. Millar said that every member should give special consideration to criticising it and offer suggestions for its betterment.

Effect of Alternating Current and Direct Current on Performance of Tungsten Lamps

That modern high-grade tungsten lamps exhibit comparatively little difference of commercial importance in life and efficiency whether run upon 60-cycle alternating current or direct current was the conclusion of an extended paper by John W. Lieb, New York. The data presented were drawn from tests of the lamp committee of the Association of Edison Illuminating Companies. Tests have been made of both the straight-filament vacuum-type lamp and the coil-wound gas-filled lamp. Up to 1,000 hours' life the behavior of lamps on both alternating-current and direct-current service showed comparatively little variation, gains in life being offset by losses in efficiency on alternating current, and vice versa.

In the discussion J. B. Taylor suggested comparing lamps on the basis of average rather than initial efficiency. Louis Bell, Boston, congratulated the industry on attaining lamps which hold up their efficiency and candlepower well until the normal useful life of around 1,000 hours is reached and then drop suddenly as an indication that replacement is desirable. Other speakers emphasized the importance of obtaining research data concerning the effect of vibration upon flashing, railway-signal and other lamps subjected to shocks in service and thought there was no need in purchasing lamps to be concerned with small differences in service voltage.

C. H. Sharp, Washington, pointed out that a very small filament will give a power-factor effect in alternating-current service.

Nomenclature

In presenting the report of the committee on nomenclature and standards, Clayton H. Sharp, the chairman, pointed out that while the report has been accepted as an American standard by the American Engineering Standards Committee, provision has been made through the machinery of a sectional committee, composed of all interested parties, for undertaking necessary revisions.

F. E. Cady and several others objected to the use of the term "lighting" for the time integral of luminous flux because of its present employment to express other things.

Both M. Luckiesh and Louis Bell were very much opposed to using "light" to express "luminous flux," in view of the existence of the latter term, and advocated that "light" be used to indicate visual sensation instead.

The continued use of the candlepower for expressing lamp ratings was severely criticised by E. C. Crittenden, who said that the proper expression, "luminous flux," is used entirely too little.

Analyses of Glare Show Need of Further Research

An attack upon the problem of glare from the angles of visual acuity and shade perception was the basis of research described by a sub-committee on that subject headed by Louis Bell, Boston, the other members being F. H. Verhoeff and L. T. Troland of the same city. Experimental investigation led to the following three conclusions: (1) That a quantitative study should be made of veiling glare with respect to the extent by which reduction of contrast actually interferes with acuity so as to produce discomfort; (2) that it is not definitely known with respect to dazzle glare just how and where in the refractive media the effect is produced, and in particular a quantitative examination of the extension of the dazzle area with increase in intensity of the incident light is much needed; (3) that studies made on light sources of considerable area be extended to make clear their effect, not only in reducing dazzle glare, but in lowering the retinal sensibility so as to interfere with vision through the production of negative after-images of the luminous area.

Education

Lighting education, as conducted by the committee of which Prof. F. C. Caldwell was chairman, has consisted chiefly of popular lectures before clubs and societies of various kinds and the suggestion of subjects for research. The chairman declared that this work must be supplemented by individual effort on the part of members.

Dalmarnock Station Operating Results Reported

Glasgow Power Station, Embodying Latest Features in British Design, Generates a Useful Kilowatt-Hour for Every 1.716 Lb. of Coal Consumed

THE Dalmarnock power plant of the Glasgow (Scotland) Corporation represents the latest development in British power-station design. It is on the bank of the Clyde River near the eastern boundary of the city and is being constructed in two stages, ultimately to have a capacity of 150,000 kw. The first section comprises one-half this amount. There are five 15,000-kw. turbo-generators supplied with steam from two independent boiler houses, each containing eight marine-type Babcock boilers of 6,948 sq.ft. of heating surface. The cost of the present part of the plant will be at the rate of £20 per kilowatt.

The units are rated at 15,000 kw., but they can carry

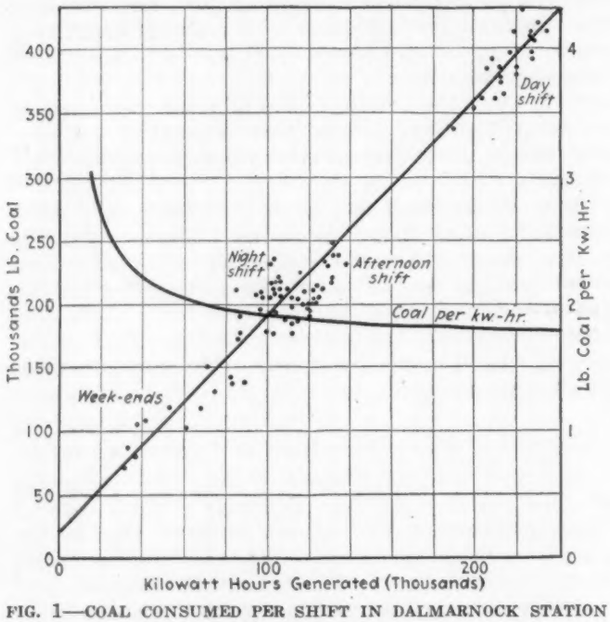


FIG. 1—COAL CONSUMED PER SHIFT IN DALMARNOCK STATION DURING ONE MONTH

18,750 kw. continuously. Three-phase current is produced at 6,500 volts, and the voltage is raised to 22,000, at which the principal switching operations are performed.

The boilers are equipped each with three chain-grate stokers of 273 sq.ft. grate area. They contain B. & W. superheaters of the "integral" type of 2,452 sq.ft. heating surface each. There are one Green economizer for each boiler and a chimney for each pair of boilers. The working boiler pressure is 275 lb. and the steam temperature 700 deg. F.

A set of curves showing the performance of the Dalmarnock station for a recent month, with comments, was given in the issue of *Engineering* (London) for Sept. 1. Two of these are reproduced in Figs. 1 and 2. As was explained by R. B. Mitchell, chief electrical engineer of the Glasgow Corporation, in a paper read May 30, 1922, before the Institution of Electrical Engineers, he uses the R. H. Parsons plan for keeping a check on the station performance. The water and coal consumption and the electrical energy production are determined for each eight-hour shift. Thus the operating efficiencies of the different shifts can be compared.

The data given in the curves cover eighty-four shifts, making up the four-week period, during which the output per shift varied between about 3,000 kw.-hr. and more than 230,000 kw.-hr. The aggregate for the period was 9,784,000 kw.-hr. The average thermal content of the coal, from daily analyses, was 10,500 B.t.u. The straight line shown in Fig. 1 was drawn to pass as nearly as possible through the plotted points and its equation is found to be

$$C = 20{,}000 + 1.716\ K,$$

where C is the number of pounds of coal burned per shift and K the kilowatt-hours output per shift. The figure 20,000, of course, represents the coal consumed to supply the constant no-load losses.

The curve of coal consumption per kilowatt-hour was derived from this equation.

Fig. 2 shows similar data for water consumption. The equation of the straight line in this case is:

$$W = 100{,}000 + 11.535\ K,$$

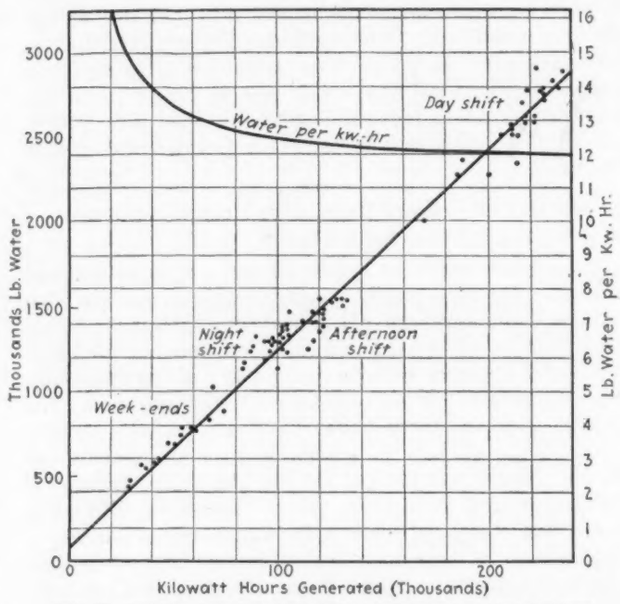


FIG. 2—WATER EVAPORATED PER SHIFT FOR SAME PERIOD AS IN OTHER FIGURE

where W is the total number of pounds of water evaporated per shift and K is as above. The no-load steam consumption per shift is obviously 100,000 lb.

From the third equation given a third relationship can be deduced, in either of these forms:

$$C = 5{,}123 - 0.1487\ W$$

or

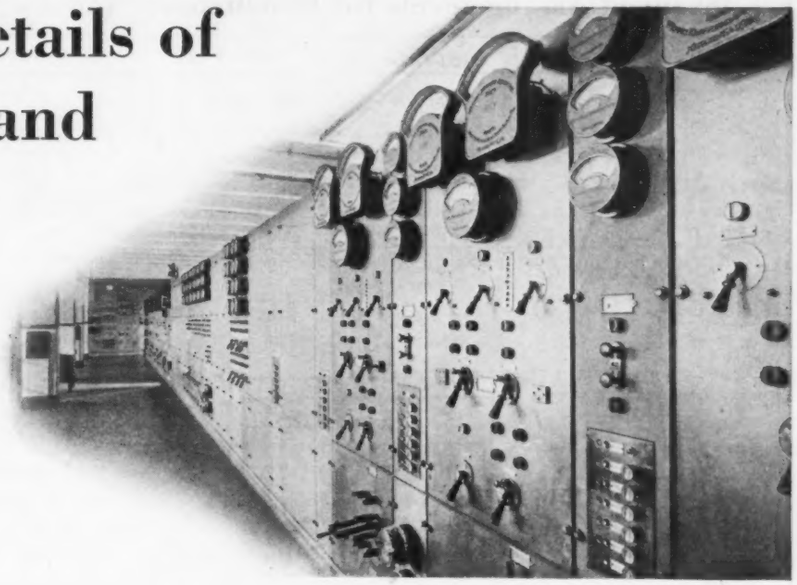
$$W = 6.722\ C - 34{,}440.$$

The first of these shows that if no water were evaporated, the coal consumption would be 5,123 lb. per shift, representing the radiation and other heat losses in the boiler room. The difference between 20,000 lb. and 5,123 lb., or 14,877 lb., is the coal consumption per shift to cover losses in the turbine room. This is the coal required to generate the 100,000 lb. of steam required at no load.

Summarizing the above data, it appears that every useful kilowatt-hour generated requires the expenditure of 1.716 lb. of coal and the evaporation of 11.535 lb. of water, apart from standby losses. These figures represent conditions for the period taken.

Installation Details of Switchboards and Control Pits

By W. FRANK SUTHERLAND
Toronto Hydro-Electric System



Disadvantages of the Standard Switchboard Base—Examples of Sightly and Convenient Construction—Red Floor Tile the Best Surface—Details Appl cable to Boards of Various Kinds

WITH increasing capacity and the equipment now available, the well-designed present-day station offers opportunity for refinement in detail impossible of achievement in the smaller hand-operated stations of a few years ago. Electrically remote-controlled switching is now standard in even the lower voltages, and with its adoption the unsightly busbars, oil switches and cables of directly operated alternating-current switchboards have been eliminated. Remote-controlled, hand-operated switching equipment, which likewise had a distinct sphere of usefulness in the smaller installations, is no longer considered for works of any magnitude, and the cumbersome bank of operating rods is also done away with. The remote operation of oil circuit breakers and of carbon breakers in direct-current work by electrical means has, on the other hand, added to the complexities of conduit layout. The amount of control wiring is increased, and it is necessary to provide more adequate facilities for conduit termination at the switchboard than formerly was the custom.

For this reason it is desirable to arrange for some type of construction superior to the standard switchboard base consisting of a 6-in. channel fastened to the concrete floor with expansion bolts. This type of base is shown in Fig. 1, and according to usual practice the control conduit is brought up at the rear of the switchboard. In thin floors the necessity of having the bends from horizontal to vertical exposed makes an unsightly job. This arrangement also suffers from the disadvantage of not providing any means of cross-connecting panels other than by running the desired control leads in a horizontal direction across the back of the switchboard, complicating the wiring and preventing the neat arrangement so greatly to be desired. Panel wiring in all cases is greatly aided if most of the leads run in a vertical direction from points of entry at the bottom of the panel with as few cross-overs as possible. The control-wire exit from the conduit bushing is another point which is difficult to make much of, since the leads are apt to present a somewhat unsightly appearance no matter how carefully arranged.

Apart from the foregoing considerations, which rule out of the question a base of this character in any but moderate-sized stations, the necessity of bringing each conduit up behind the panel to which it belongs and the well-nigh impossible task of making alterations, relocating panels, etc., render it advisable to secure a more flexible arrangement.

Such a plan is shown in Fig. 2. The concrete-finished floor has been retained, making it suitable for a comparatively inexpensive installation. The pit shown at the rear of the board can be made as deep as desired, although if the switchboard is installed on a beamed floor, little is gained by carrying it below the top of the floor steel, since a level pit bottom is preferable for ease in laying control cables. Usually a depth of about 6 in. or 7 in. can readily be secured. The width is somewhat dependent on the length of board, location of conduit entrance with respect to control panel and the probable number of cross ties between panels. In general a width of 2 ft. 6 in. will be found sufficient for the usual station, while for extremely large ones the pit may readily be made wider or another type of construction may be used. The 6-in. channel-base has been retained, fastened in the usual manner to the floor by expansion bolts, but underneath each panel the floor has been cut away, forming a wiring space through which the control leads pass to the wooden bushing shown in the channel web. The acetylene torch provides a handy means for cutting the hole in the web for the bushing, and with reasonable care quite a satisfactory job can be made. The bushing itself is formed from two pieces of molding doweled into the semi-circular ends, turned from a single piece and split.

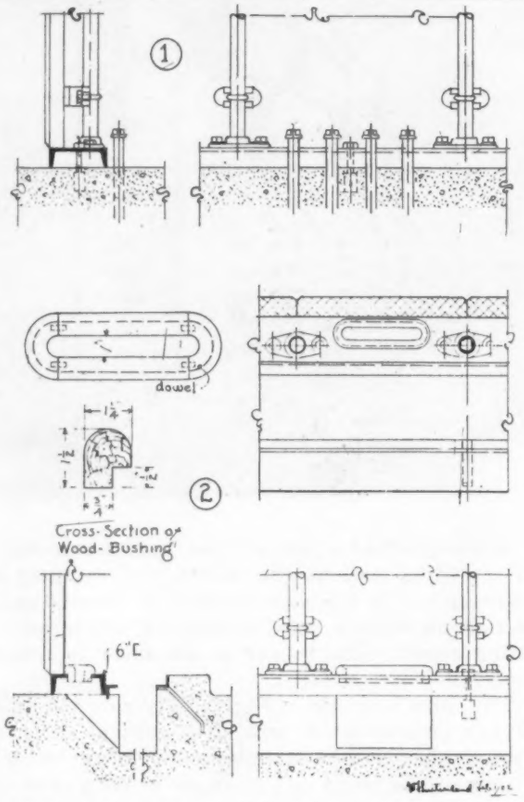
The expansion bolts holding the channel to the floor are placed immediately underneath the pipe flanges terminating the panel supports. This allows them to be placed in solid concrete and improves the appearance by hiding them from view.

Advantages of Asbestos Wood for Pit Covers

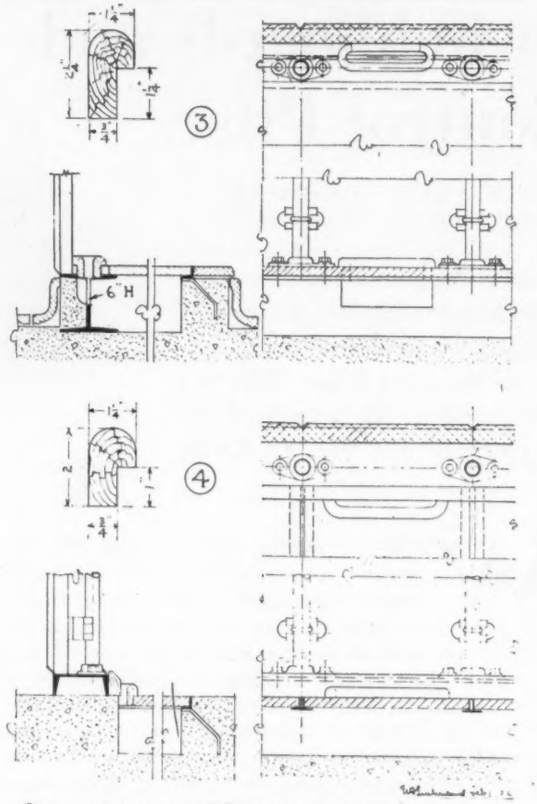
Several materials are available for covering the pit—wood, steel plate, or preferably 1-in. asbestos wood. Wood, of course, constitutes a fire hazard which should be eliminated. Checkered steel plate, while presenting

Convenient Arrangements for Switchboard Mountings and Control Wiring Pipes

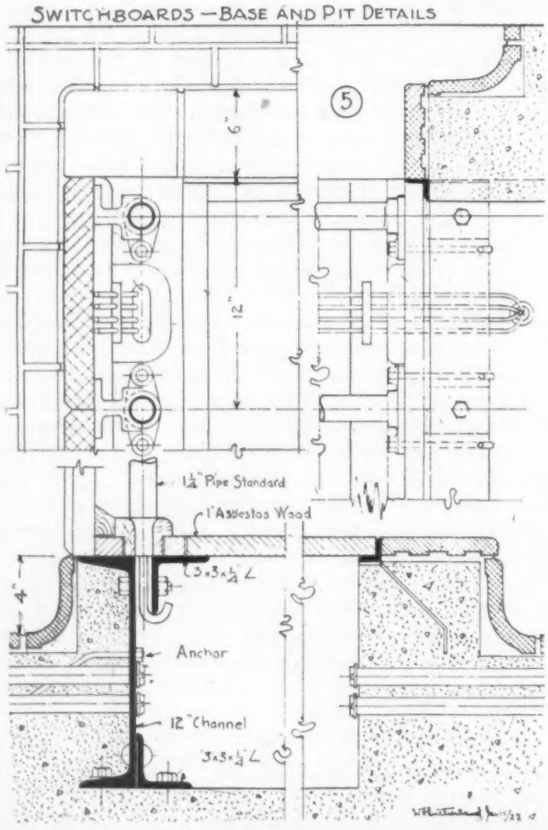
SWITCHBOARDS—BASE AND PIT DETAILS



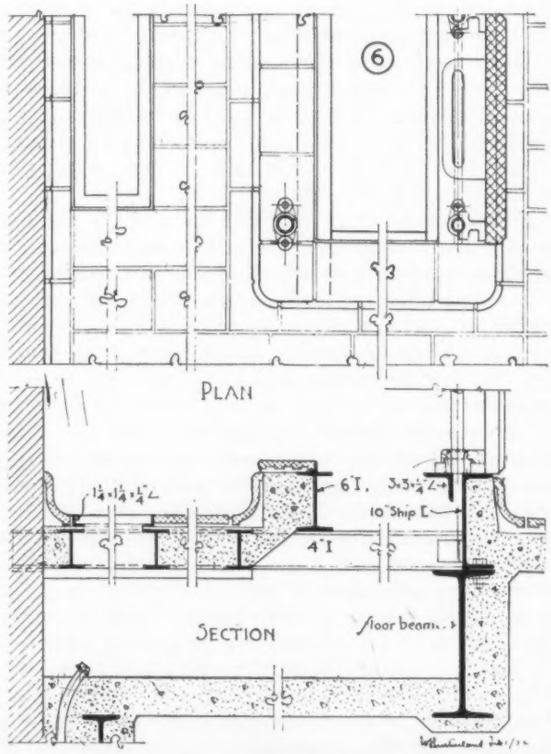
SWITCHBOARDS—BASE AND PIT DETAILS



SWITCHBOARDS—BASE AND PIT DETAILS



SWITCHBOARDS—BASE AND PIT DETAILS



a neat appearance and being reasonably cheap, is open to the objection that if a plate slips while being removed or replaced the sharp edges are apt to cut the control cables underneath. Asbestos wood can readily be obtained in 1-in. thickness and is quite strong enough to withstand any of the abuse to which it may be subjected. It has also an attractive appearance and is easily removed or replaced.

To provide a pit curb and a smooth surface for the asbestos-wood cover, angle iron is shown, anchored into the concrete on one side and riveted to the channel base on the other. Throughout this article where such angle is referred to it is 1¼ in. x 1¼ in. x ¼ in. in size, this particular shape permitting the asbestos-wood cover to come flush with the top edge of the angle and to lie flat with the concrete or tile curb.

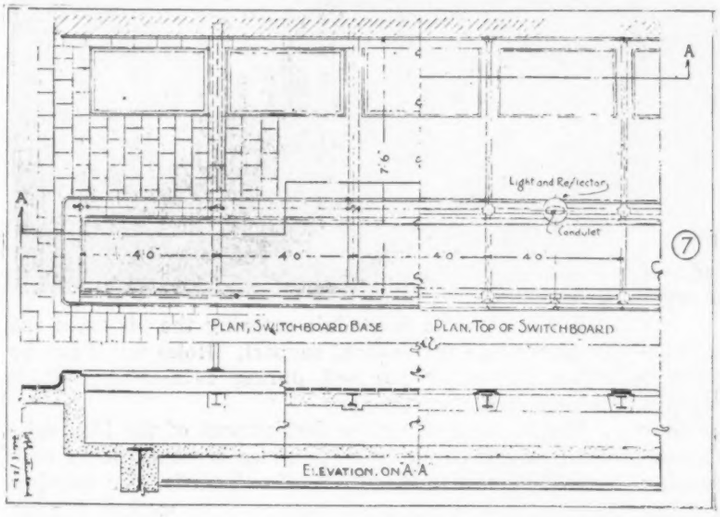
A development of the arrangement shown in Fig. 2 which eliminates the cutting of the web of the channel is shown in Fig. 4. Here the leads are not brought up through the channel but up against a cleat block of oak or other wood of good appearance. Onto this block, which runs the full length of the board, the leads are fastened by means of the usual fiber or metal cleats.

The asbestos-wood pit cover is cut away for a suitable distance at each panel and the opening finished off with a wooden curb. This construction provides a wiring slot through which the leads pass and still leaves the pit covers freely removable. The cover is, however, weakened and should be supported by T-irons or angles placed back to back. These supports can be let into pockets under the channel and can be riveted to the curb or left freely removable, a notch being cut in the bottom flange of the curb angle for their reception. This construction is suitable for boards of moderate length where cheapness is a first consideration.

Too little attention is frequently paid to the character of floor surface in stations. Concrete is the usually accepted material, and its frequent painting becomes a matter of necessity if a presentable appearance is to be maintained. In transformer houses, stations of moderate capacity and buildings of like use, where traffic is light and appearance of no consequence, a concrete floor, painted if need be, can hardly be improved on. On the other hand, a more permanent and better-looking floor should be used in stations of any importance.

A bare concrete surface makes dust, and the addition of floor hardeners, etc., only delays the evil day when the floor requires painting. Painting to obtain satisfactory results is a difficult task, and a liberal quantity of paint is required. The finished result, too, is frequently of good appearance only for a short time, a new coat being required once a year.

The choice of more suitable surfacings is limited. Wood is out of the question, and mastic or other forms of bituminous or asphaltic floorings are equally unsatisfactory. Of the various floorings on the market probably the best, everything considered, is red floor tile of the vitrified variety. Such tile comes in various sizes, the 6-in. x 6-in. or 6-in. x 9-in. shapes being usually preferred. The tile runs about ⅜ in. thick over all and is provided with grouting grooves on the underside. It should be laid up with about a ⅜-in. joint, and in the design of the building about 1½ in. should be allowed from top of concrete floor to top of finished tile for bedding.



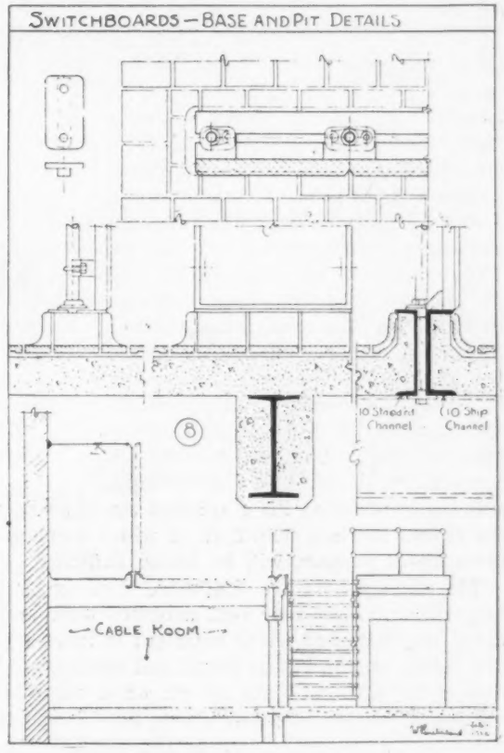


FIG. 7—SWITCHBOARD FOR MOUNTING ON TILE WITH AMPLE ROOM FOR PIPE RUNS.
FIG. 8—ELEVATED BOARD WITH CABLE ROOM BELOW

Objections may be raised to the use of a supposedly fragile material, such as tile, under transformers and other heavy equipment through fear of its cracking and chipping. Experience extending over a considerable number of years has proved this fear groundless, and the marked improvement in station appearance and cleanliness has amply compensated for the initial expense involved. Transformers weighing 15 tons can be set down on a tile floor by crane or moved by rollers on skids with no fear of its cracking.

The cost of laying tile floors varies with the locality, and no very definite costs can be given applicable to all conditions; but in general, comparing the annual charges on a tile floor with the cost of annual painting for concrete, it is found that tile will stand at least on an equal footing.

In designing a switchboard floor, together with the supporting structure for panels, tile lends itself to the attainment of attractive results. Cove and other special tiles are available, and their use permits the raising of the switchboard panels above floor level by about 4 in., adding to the general appearance of the board. What is of more importance, this form of construction renders it possible to keep the sub-panels free from dirt.

An arrangement of switchboard steel patterned somewhat after that of Fig. 2 but adapted to the use of tile floors is shown in Fig. 3. A 6-in. "H" beams replaces the channel of Fig. 2, raising the board sufficiently to accommodate the 4-in. cove tile underneath. The pit curb at the rear of the board is also raised by a corresponding amount, permitting a greater pit depth if desired.

In Fig. 5 is shown the nucleus around which several quite successful switchboard designs have been developed. The arrangement shown is adapted for use in places where a fairly deep pit can be used. A 12-in. structural channel forms the main member of the base. To it is riveted a 3-in. x 3-in. x ¼-in. angle for adequate bearing on the concrete pit bottom. Expansion bolts are provided as well as anchors into the floor concrete midway up the channel. Another 3-in. x 3-in. x ¼-in. angle is riveted to the top of the channel, a ¾-in. slot being left by means of spacer blocks 2½ in. wide by ¾ in. thick at each panel support. The width of panels is usually determined beforehand, and the location of these spacers can thus be fixed. If the panels are less than 2 ft. in width a spacer at every other panel support will be found sufficient.

The slate panels are supported directly by the channel, while at their rear 1-in. asbestos wood strips cut to panel length and of width sufficient to leave a 1-in. ledge are placed on top of the structural members. The floor flanges for pipe supports are placed on top of the asbestos wood, being fastened down by "J" bolts passing through the slot and engaging the vertical flange of the angle. The asbestos-wood filler is slotted to permit of the insertion of the wood bushings, and the resulting wiring channel offers a free run for control wires with no obstructions or sharp corners.

Choice of Panel Sizes Permitted

The construction above outlined has several important advantages, one of which is inherent in the choice of panel sizes afforded. For instance, 12-in., 18-in. or 24-in. panels can also be readily mounted as well as larger ones if desired, since no holes have to be redrilled and tapped, while the asbestos-wood fillers can be replaced with those of the desired length and a change made with very little trouble. Should one of the spacers holding the channel and angle apart come within one of the wiring ducts, it occupies little room and does not cut down the wiring space materially.

A further advantage is seen in the ease with which the board can be brought into alignment from end to end, since about ½-in. adjustment is possible without any drilling and tapping of holes for floor flanges, as is the case where they are rigidly bolted to the channel base.

Slate seldom comes in exactly even widths and frequently is oversize. On a long board with holes drilled in the channel or other support there is no latitude for this, and the placing of panels is sometimes a matter of some difficulty. At times too when a panel is to be removed a hacksaw blade has to be run down the joint to permit of pulling the slate out. It is advisable in all switchboard design where long boards are being erected to allow about ⅛ in. clearance in every 2 ft. to facilitate slate erection and removal.

With the supporting design here shown this allowance can still be made, but individual panel adjustment is greatly facilitated.

AMPLE SPACE IN REAR OF BOARD FACILITATES MAINTENANCE

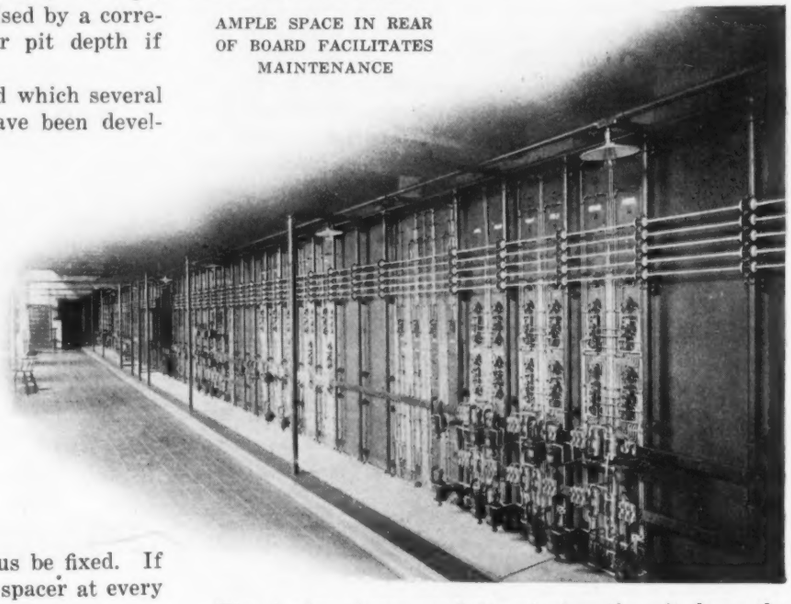


Fig. 5 also shows conduit entering the pit from the front through the channel support. Holes for it can be either drilled or punched during fabrication, which facilitates the installation.

Fig. 6 shows a further development of the idea suitable for switchboards on galleries or other floors supported by structural steel. The facilities for running control cable are also greater, and the method is thus suitable for larger stations. A 10-in. ship channel now supports the slate and provides a greater flange width than the standard 10-in. channel. It is carried directly by the floor steel, which also supports floor members spanning to the building wall. These members also serve to brace the ship channel. Small I-beams are framed in to carry the concrete floor and tile work. The cable pit thus provided gives ample space for longitudinal runs of cable from conduits to panels or from panel to panel on the board itself.

Fig. 7 shows a general plan of a switchboard detail of the same type. A better idea is gained of the pit openings and tile arrangement, and a portion of the pipe framework is also shown. Vertical standards are carried down every 4 ft. or so, depending on panel sizes. to the rear curb of the switchboard pit, while the longitudinal pipe joining them at the top serves as a conduit for rear switchboard illumination.

Story heights in stations are defined by headroom over transformers, switch-structure dimensions or some other like consideration, and are oftentimes considerably greater than necessary for switchboard bays. Where this is the case and where much control conduit

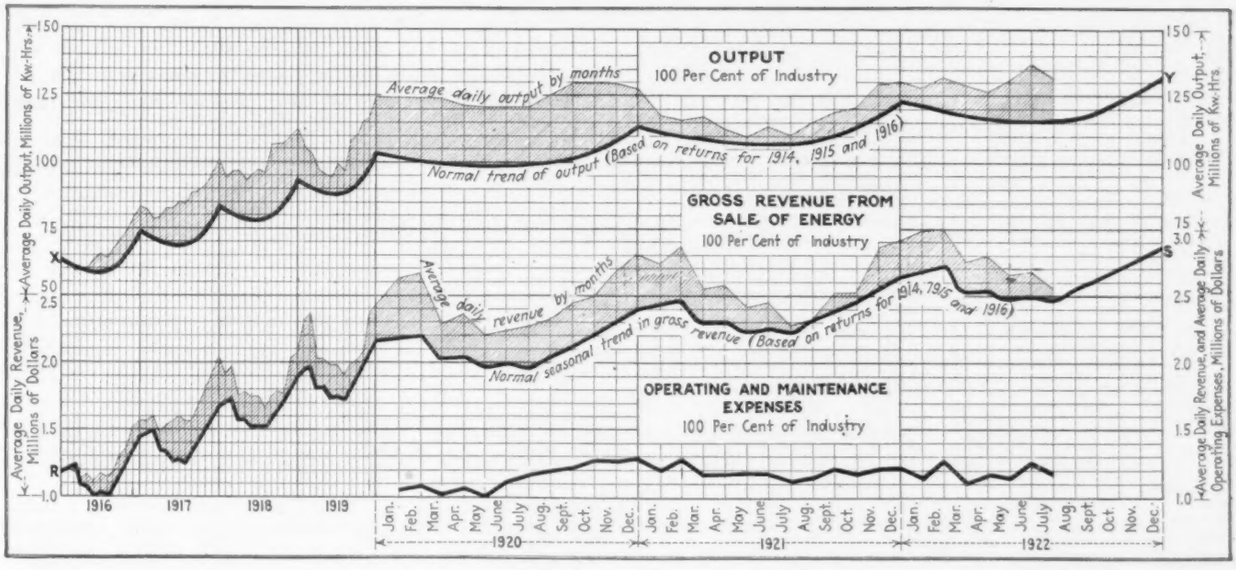
has to be run it is frequently possible to elevate the switchboard floor 7 ft. or 8 ft. and thus make provision for a cable room underneath. An arrangement such as this is shown in Fig. 8, and an economy in over-all width is evident. The switchboard base is now formed of two channels—a 10-in. ship channel and a similar standard channel bolted together with a ¾-in. wiring slot between. A cleat block is attached to the front channel or to the panel, no asbestos being used. The floor flanges now rest on a cast washer, detailed to larger scale, and the bolts through the flange draw up against a similar washer underneath. Control cables may be racked on the walls of the cable pit and on intermediate supports, or the conduit itself may be similarly treated, exit being made as close to the controlling panel as possible. This arrangement renders an exceedingly satisfactory architectural treatment possible and elevates the operating platform sufficiently for good observation.

The above constructions have been developed with the requirements of control boards largely in mind, although the details given are equally applicable to railway boards mounting carbon breakers and automatic equipment where many control circuits are found.

Both angle iron and pipe are used for the supporting of switchboard panels. For heavy boards mounting large breakers and boards subjected to much shock a heavy structural framework is almost essential, but for control boards and for boards mounting remote-controlled or hand-operated breakers up to say 3,000-amp. capacity a pipe framework is perfectly satisfactory. Needless to say, adequate bracing should be given to either structure. The details here set down have been developed with pipe framework in mind, although a number of them with suitable modifications are applicable to angle-iron construction as well.

In conclusion the writer wishes to acknowledge his indebtedness to the Toronto Hydro-Electric System for permission to incorporate in this article data based on its practice.

Midsummer Energy Output Increases 20 per Cent


OUTPUT
100 Per Cent of Industry
Average daily output by months
Normal trend of output (Based on returns for 1914, 1915 and 1916)
GROSS REVENUE FROM SALE OF ENERGY
100 Per Cent of Industry
Average daily revenue by months
Normal seasonal trend in gross revenue (Based on returns for 1914, 1915 and 1916)
OPERATING AND MAINTENANCE EXPENSES
100 Per Cent of Industry
Average Daily Output, Millions of Kw-Hrs.
Average Daily Revenue, Millions of Dollars
Average Daily Revenue, and Average Daily Operating Expenses, Millions of Dollars
1916
1917
1918
1919
1920
1921
1922

REPORTS received by the *Electrical World* for the month of July from central generating and distributing companies representing 83 per cent of the installed rating of the country indicate that the output in the aggregate was about 4.2 per cent below the record output reported during June. According to government reports, several of the primary industries which purchase large quantities of electrical energy from central-station companies were operating considerably below the point of activity reached in June, with resultant reduced energy requirements. It is probable that the addition of new domestic lighting customers during July was more than sufficient to overcome any seasonal decrease in domestic lighting requirements, and that the decreased output must be attributed almost solely to decreased industrial energy requirements.

The gross revenue during July was the lowest since October, 1921, being about 16.3 per cent under the record revenue reported during February, 1922.

The extent of the real progress of the electric light and power industry during the period of rehabilitation of American industry in general is seen when current figures are compared with those for a year ago. The electrical energy from which revenue was received totals 4,080,000,000 kw.-hr. in July of this year, as against 3,390,000,000 kw.-hr. during July, 1921, an increase for the twelve-month period of about 20.4 per cent. The gross revenue from sale of energy increased from $71,500,000 during July, 1921, to $79,400,000 during July of this year, or an increase of about 11 per cent. Moreover, going back to 1920, the peak year of activity in American industry in general, the output of July, 1922, was about 9 per cent above that of July,

TABLE I—CENTRAL STATION RETURNS FOR THREE MONTHS

Month	Percentage of Installed Ratings Represented	Kw.-Hr. Output (Companies Reporting) 1922 Thousands	1921 Thousands	Per Cent Increase	Percentage of Installed Ratings Represented	Revenue from the Sale of Energy (Companies Reporting) 1922 Thousands	1921 Thousands	Per Cent Increase	Month	Percentage of Installed Ratings Represented	Operating and Maintenance Expenses (Companies reporting) 1922 Thousands of Dollars	1921 Thousands of Dollars	Per Cent Increase	OPERATING RATIO Steam Plants 1922	1921	Hydro Plants 1922	1921	Combined Systems of Steam and Hydro 1922	1921
May..	83	3,380,602	2,804,535	20.2	76	$62,295	$57,789	7.8	May.	62	22,785	22,378	1.8	53.7	58.1	25.1	22.4	43.3	46.0
June..	83	3,402,951	2,809,183	21.0	76	61,324	55,291	10.9	June.	62	22,758	21,849	4.2	54.2	56.9	26.4	28.1	44.9	48.5
July...	83	3,393,882	2,818,309	20.2	76	60,303	54,365	10.9	July.	62	22,800	21,586	5.5	55.3	56.8	27.9	28.5	46.1	48.1

1920, and the revenue showed an increase of about 12.3 per cent during the same period. These figures, taken in conjunction with the fact that during the last twenty-four months about 2,500,000 new customers of all classes were added to the central-station lines, present a picture of progress and prosperity which is probably unsurpassed by any other primary industry of the country.

Expressing the financial phase of the returns in terms of the operating ratio, or ratio of operating expenses to gross revenue from sale of energy, gives further evidence of the increased prosperity of the electric light and power industry. Although in July the operating ratio of companies having steam generating plants only, taken in the aggregate, was 55.3 per cent, as against 45.7 per cent in January of this year, such an increase in operating ratio between winter and summer months is to be expected on account of the relatively higher percentage of low-revenue industrial energy sold during the summer months. The evidence of the tendency toward financial prosperity in the industry is found in the fact that the operating ratio decreased from 56.8 per cent in July, 1921, to 55.3 per cent in July of this year.

The Mountain and Pacific States are the only section which reported energy consumption on a par with the record month of June. Every other section of the country reported a material drop in output, it being most pronoounced in the New England section.

International Efforts to Reduce Radio Interference

COUNTRIES which are employing radio communication in rapidly increasing degree have been compelled to arrive at a mutual understanding in order to avoid interference and delay in traffic. Five different types of waves have been standardized which produce various amounts of interference at a given distance from the transmitting aërial, the decrement serving as a criterion. Thus radio telephony is to be carried on by waves ranging from 1,550 m. to 1,650 m. for fixed stations and 300 m. to 340 m. for mobile stations, but the decrement of the waves used must not be greater than 0.005.

For mutual benefit it is proposed to ask every nation represented at the next international conference on radio communication to supply particulars not only of stations in use, but also of projected stations that may be erected in the succeeding five years.

TABLE II—CENTRAL-STATION RETURNS BY SECTIONS OVER A THREE-MONTH PERIOD

Month	New England States: Percentage of Installed Ratings Represented	1922 Thousands	1921 Thousands	Per Cent Increase	Atlantic States: Percentage of Installed Ratings Represented	1922 Thousands	1921 Thousands	Per Cent Increase	North Central States: Percentage of Installed Ratings Represented	1922 Thousands	1921 Thousands	Per Cent Increase	South Central States: Percentage of Installed Ratings Represented	1922 Thousands	1921 Thousands	Per Cent Increase	Pacific and Mountain States: Percentage of Installed Ratings Represented	1922 Thousands	1921 Thousands	Per Cent Increase
KW.-HR. OUTPUT:																				
May.....	82	241,879	200,030	20.1	83	1,207,306	984,646	22.5	82	1,108,924	935,268	18.5	62	166,171	138,576	19.9	95	656,322	546,015	20.1
June.....	82	242,700	200,343	21.2	83	1,194,549	978,178	22.0	82	1,113,375	917,708	21.2	62	167,420	140,425	19.2	95	684,907	572,529	19.6
July.....	82	227,768	193,144	17.9	83	1,182,792	967,859	22.2	82	1,109,572	910,088	21.8	63	165,982	142,140	16.8	95	707,768	605,078	17.0
REVENUE:																				
May.....	82	$5,787	$5,508	5.1	76	$22,579	$21,204	6.5	69	$20,237	$18,175	11.3	62	$4,131	$3,782	9.2	95	$9,561	$9,120	4.8
June.....	82	5,791	5,422	6.8	76	22,354	20,440	9.5	68	19,025	16,763	13.5	61	4,138	3,806	8.8	95	10,016	8,860	13.0
July.....	82	5,728	5,300	8.1	76	21,868	19,829	10.1	68	18,669	16,408	13.8	63	3,981	3,717	7.1	95	10,057	9,111	10.4
OPERATING EXPENSES:																				
May.....	53	$1,617	$1,692	−4.4	57	$7,537	$7,397	1.9	55	$8,369	$7,848	6.7	61	$1,866	$2,043	−8.6	93	$3,396	$3,398	−0.0
June.....	53	1,751	1,937	−9.6	57	7,691	7,362	4.5	55	7,720	7,133	8.3	61	2,179	2,051	6.2	94	3,365	3,421	−1.6
July.....	53	1,782	1,765	1.0	57	7,784	7,327	6.2	55	7,875	7,181	9.6	62	1,896	1,951	−2.9	94	3,463	3,362	3.1

TABLE III—AGGREGATE OPERATING RATIO OF COMPANIES REPORTING DATA MONTHLY TO THE "ELECTRICAL WORLD"

Type of Generating Plant and Month	New England States 1922	1921	Average for Previous 12 Months 1922	1921	Atlantic States 1922	1921	Average for Previous 12 Months 1922	1921	North Central States 1922	1921	Average for Previous 12 Months 1922	1921	South Central States 1922	1921	Average for Previous 12 Months 1922	1921	Mountain and Pacific States 1922	1921	Average for Previous 12 Months 1922	1921
Steam Plants:																				
May	58.8	62.4	57.1	66.0	54.4	58.0	50.6	56.6	50.6	58.8	61.5	52.0	54.1	56.1	50.1	55.1	54.7	56.3	48.8	55.3
June	56.5	66.3	56.8	65.7	54.8	56.6	50.4	56.3	54.8	56.8	51.9	60.4	52.2	54.5	49.9	55.7	46.6	54.2	48.3	55.0
July	54.3	62.4	56.3	64.5	56.2	57.3	50.3	55.9	56.7	55.8	51.8	59.3	51.9	53.9	49.7	54.9	49.7	52.6	48.0	54.4
Hydro Plants:																				
May	32.0	28.7	33.2	42.1	16.2	18.0	18.5	22.7	22.1	22.7	22.3	22.6	33.0	28.0	36.4	34.4	35.2	32.8	27.2	26.8
June	36.5	37.0	33.8	43.1	26.9	26.1	19.9	23.4	21.3	20.5	22.6	22.4	32.0	27.3	36.5	34.8	25.1	20.0	29.6	26.1
July	40.6	49.9	34.4	43.8	24.5	22.1	20.5	23.4	20.5	26.0	22.6	22.9	50.2	47.8	42.1	39.6	28.2	28.1	27.3	26.9
Combined Systems of Steam and Hydro Plants:																				
May	46.2	49.4	52.4	52.5	44.8	45.3	45.4	49.5	50.6	55.1	47.7	55.8	38.5	44.5	43.1	45.3	31.3	34.4	36.6	40.7
June	48.8	58.7	51.9	52.4	48.7	51.0	45.8	49.8	51.4	53.7	48.3	55.2	43.7	49.3	43.0	45.8	31.9	38.0	35.8	40.0
July	53.2	56.7	51.6	52.1	51.3	52.0	46.7	50.0	54.8	56.3	48.9	54.6	41.2	48.4	42.9	46.1	30.5	33.6	35.3	39.0

Marked Interest in Electric Ovens

Fourteen Papers on This and Allied Subjects Constituted the Major Portion of the Montreal Convention of the American Electrochemical Society—Development of Enameling Ovens and Construction Given Chief Consideration

MORE than the customary attention was directed at industrial electric heating and allied subjects by the American Electrochemical Society in its convention at Montreal this year. Fourteen papers were presented on electric enameling ovens, properties of resistor alloys and granular carbon, heat insulation, high temperature furnace design, electric steam boilers and the like. High points in some of these papers and discussions are reported below. There was much animated discussion due to a strong representation by opposing factions. The manufacturers of apparatus claimed perfection in design and high efficiency in operation; the users of this apparatus, however, were anxious to point out what they considered inherent weaknesses of the product. The general impression gained was that even closer co-operation than practiced in the past was needed between designer and builder of electric ovens, furnaces and other apparatus on the one hand and the user or consumer of these on the other.

ELECTRIC HEATING FOR ENAMELING

"The development of the electrically heated enameling oven within the past seven years is due to a concentration of effort on the part of electrical manufacturers and central-station companies upon a single industry—the automotive," said Wirt S. Scott in his paper on this topic. At first the cost of operation was excessive as compared with gas, and for this reason attempts were early made to reduce the amount of heat carried off in the vent ducts, since no air was required for combustion. However, the experiments indicated that a certain amount of air was required for oxidizing the enamel. Furthermore, it was found that with restricted ventilation explosions were possible regardless of the temperature of the heating element. A sufficient amount of air must be admitted to the oven to keep the mixture lean or sufficiently dilute to make an explosion impossible. The vapors should be withdrawn at or as near the floor as possible. Repeated tests showed that one-third loss air could be used when ventilating from the floor, and that the length of time required for baking was reduced 25 per cent. To overcome the difficulties arising from the enamel dripping on the floor of the oven it was found advisable to place the heaters along the side wall but as near the floor as possible. Ventilating from the floor, the heated air passed up along the side walls across the roof and down through the middle of the oven. This method of circulation produces a uniform distribution of temperature. Since conduction of heat by metal extending from the inside of the oven to the outside was found to account for 50 per cent of the entire radiation loss, attempts have been made to reduce this loss as much as possible. Approximately 95 per cent of all electrical troubles occurred in the terminals or connectors in the early ovens, but this has been reduced.

One of the most important developments has been that of the automatic temperature control for ovens. In ventilating electric ovens from the roof twenty changes of air at room temperature were figured as sufficient, but later, with the use of the floor method of ventilation, ten changes of air at oven temperature were estimated to be sufficient to keep the volatile gases sufficiently dilute to prevent explosions. To provide for these conditions, motor-driven exhaust fans were used. In order to eliminate the possibility of explosions due to vapors condensing and solidifying in the vent ducts, a system has been perfected which, in connection with a motor-driven exhauster, automatically shuts off the power the instant the exhaust duct becomes restricted in any manner or if the runner of the exhaust fan becomes loose on its shaft.

With electric ovens the baking period has been reduced less than one-half, and with enamels baking at 450 deg. F. the baking period has been reduced to one hour and in some cases to thirty minutes. However, too short a bake is injurious to the enamel. Two things are essential in the baking of enamels—a uniform protective coating of enamel and maximum adhesion between the enamel and the work. The greatest amount of adhesion and the thickest and smoothest surface of enamel is obtained when the work is heated at such a rate as will permit the metal to become uniformly heated at the same rate as the enamel on its surface.

Explosions have occurred owing to the volatile gases being driven off too fast for the vent ducts to handle them properly. Naphtha vapors begin to come off at room temperature and for best results should be entirely liberated by the time a temperature of 250 deg. F. has been reached. Therefore, it is evident that if the work is placed immediately in an oven having a temperature of 450 deg. F. and the heat turned on the gases will be generated at an enormous rate.

ADVANTAGES OF INDUSTRIAL ELECTRIC HEATING

Wirt S. Scott also contributed a splendid résumé of the "Advantages of Industrial Electric Heating." He pointed out the following specific advantages: (1) With electric heating no products of combustion are produced that might impair the quality of the product. (2) Automatic temperature control. (3) An easier and better temperature distribution, possessing a flexibility of installation and operation not obtainable with any other form of heat. (4) Danger of gas explosions is eliminated. (5) Electric heaters respond quickly when the current is turned on and have a sufficient temperature head to force the heat quickly into the work.

Successful application of electric heat to varied processes involves not only a knowledge of the physical and chemical characteristics involved, declared E. F. Collins in a paper on this subject, but the heating device in question should be of such design as to take account of at least the laws governing the outlined conditions, tempered with good judgment resulting from experience.

Mr. Collins' paper drew forth considerable discussion. Dwight Miller dwelt at length upon the persistent prejudice against electric heating as compared with gas heating due to a biased idea of cost of operation and quality of product. The user is apt to lay too much stress upon the relative higher cost of electric power as against gas or other fuel, overlooking entirely the great improvement in quality and the increase in production. Wirt S. Scott laid stress upon the proper design of apparatus.

F. A. Lidbury deplored the lack of sufficient detailed information on the part of the manufacturer of apparatus as to the processes to be carried out in the electric heater or oven. The direct energy cost is not sufficient comparison; the first cost of apparatus and the maintenance cost must also be taken into account. Too much importance has been laid by apparatus manufacturers on the efficiency of the apparatus. Often simplicity of design is of much more importance.

Frederick J. Ryan agreed that altogether too small attention has been paid to the demands and wants of the consumer. Dwight Miller added that consumers' specifications are usually based on fuel heating practice. The consumer does not always appreciate the uniform heating with electricity as against intermittent heating with fuel. Seldom, too, has the consumer any accurate knowledge as to actual manufacturing costs.

Resistivity of Granular Carbons

To be satisfactory for resistor material, the granular carbon must have a small change in resistivity with different temperatures, a low ash content, high resistance to oxidation, and sufficient density, physical strength and hardness to withstand mechanical forces, Clyde E. Williams and Gordon R. Shuck asserted in their paper. According to investigations made by the authors the difference in resistivities of various types and sizes of carbon resistors is not very large at 1,000 deg. C. to 1,200 deg C. The temperature coefficient of resistivity is negative for all the forms of carbon tested up to 1,000 or 1,200 deg. C., at which temperature it approaches zero and then becomes positive as the temperature increases further. This change is more pronounced in graphite than in other forms of carbon. The resistivity increases as the size of the particle decreases. High resistivities are caused by the presence of volatile matter in the resistor material, the resistivity and volatile matter bearing a direct relation for the same material. Ash contained within the particle of carbon increases the contact resistivity and the thermal coefficient somewhat, but the effect is not nearly so large as is that of contained volatile matter. Extraneous ash or foreign matter of high resistivity increases the resistivity and the thermal coefficient to a very marked extent.

RESISTIVITY OF VARIOUS MATERIALS

	Resistor Material	Size, Inches: Passing	Size, Inches: On	Ash Content	Resistivity Ohms per Cubic Inch: 20 Deg. C.	Resistivity Ohms per Cubic Inch: 1,000 Deg. C.	Temperature Coefficient of Resistance
1.	Acheson graphite..	0.5	0.25	0.25	0.175	0.085	—0.00052
2.	National carbon...	0.5	0.375	0.45	1.3	0.90	—0.00032
3.	National carbon...	0.25	0.125	0.45	2.4	0.95	—0.00061
4.	*National carbon...	0.25	0.125	....	1.8	0.6	—0.00068
5.	*National carbon 600 gm. per sq.in. pressure.....	0.25	0.125	....	0.81	0.23	—0.00073
6.	Retort carbon.....	0.5	0.25	2.0	1.27	0.83	—0.00036
7.	Coal-tar residue...	0.5	0.25	0.50	1.9	1.0	—0.00048
8.	Carbonized non-coking coal (Tono)	0.5	0.25	26.0	2.8	1.5	—0.00047
9.	Gashouse coke.....	0.5	0.25	24.0	2.55	0.65	—0.00075
10.	Utah coke.....	0.5	0.25	14.0	3.7	1.5	—0.00061
11.	Carbonized non-coking coal.....	0.5	0.25	31.0	2.1	1.0	—0.00053
12.	Charcoal.....	0.5	0.25	2.5	4.0	1.1	—0.00073
13.	Charcoal mixed, 20 per cent silicious material.....	0.5	0.25	22.5	12.5	3.5	—0.00074

* Calculated from values taken from "The Carbon Electrode."

Electrical Properties of Alloys

Data were presented in a paper by M. A. Hunter and A. Jones which should enable the calculation of specific resistance of any material for either high-temperature or low-temperature ovens at any operating temperature. For ovens operating at temperatures not exceeding 500 deg. C. the various grades of nickel have been investigated together with two alloys of copper and nickel—"Monel" and "Advance"—and two alloys of iron and nickel—Alloy No. 141 and Alloy No. 193. For ovens operating at temperatures up to 1,100 deg. various grades of nichrome have been considered. Ten very valuable tables were presented, chief among which were those giving the analyses of elements in seven types of resistance material, resistance of various materials at 20 deg. to 1,000 deg. C., variation in resistance of seven alloys of nickel and chromium, variations in resistance of nickel-iron-chromium wires of two types, variation in resistance of iron-chromium wire, increase in resistance at 1,000 deg. C. for three types of nickel-chromium wire and for nickel-iron-chromium wire, the comparative life of nickel-chromium and iron-chromium wires, and the change in resistance on oxidation.

In discussing the paper Colin G. Fink referred to the present limiting percentages of chromium in the two types of nichrome wires due to the difficulty of rolling and drawing alloys with higher percentages. As knowledge of the cause of brittleness is gained, it seems safe to predict that resistance wires with as much as 40 or even 60 per cent of chromium can be produced. The influence of other elements, such as carbon, silicon, etc., is not yet fully appreciated. On the other hand, it was pointed out by Professor Hunter and Frank S. Weiser that nichrome brought into contact with asbestos, mica or other silicates at high temperatures will produce brittleness at the point of contact. E. F. Collins considered nichrome ribbon better than wire for most purposes.

Heat-Insulation Materials

Selection and application of heat-insulating materials for electric heating apparatus were the chief topics considered by J. C. Woodson in his paper. Numerous curves and data were presented. Although the insulation materials available for low temperatures are more or less numerous, he concluded that there are few satisfactory products on the market for high temperatures.

Discussing Mr. Woodson's paper, Carl Hering of Philadelphia mentioned his experience of whitewashing the outside of his furnace and thus very perceptibly improving the heat insulation. Upon compressing a porous insulating material, the heat flow through the material at first decreases, but upon further compression the heat insulation value drops off rapidly.

Prof. Alfred Stansfield of McGill University emphasized the importance of avoiding too thick a layer of outside insulating materials, such as "Sil-o-cel," especially in high-temperature furnaces. The melting point of "Sil-o-cel" and similar materials is comparatively low, and if all the heat is trapped, it soon accumulates in the inner layers, a temperature approaching that of the bath is attained and the "Sil-o-cel" melts.

Similarly it does not pay to make the roof of the electric steel furnace too thick.

Frank W. Brooke mentioned using 4½-in. "Sil-o-cel" as outside insulation, saying that it started to fuse after ten heats.

Replying to Henry Howard as to the advantages of using air spaces at definite intervals between the layers of brick or asbestos, Mr. Woodson said that above 300 deg. C. air spaces are of no advantage on account of the convection currents. There undoubtedly would be some advantage were these spaces evacuated.

High-Temperature Furnace Design

The chief requirements which should be met in electric furnaces are judged from the viewpoints of highest quality of products, lowest cost of operation and maintenance and greatest safety in operation at high temperatures, as outlined by E. L. Smalley. For example, the muffled type should be used where suited to the process. The exposed element or radiant form only should be used when adapted to a process, and these must be in a sufficient number to enable cheap renewal. The coils must be fully supported and yet free for expansion. Refractory parts must be thorougly supported, but free for expansion. No internal connections of coils should be tolerated and terminal sizes should be larger than the element size. The source of heat must be uniformly distributed and the size of the furnace must be governed by the charge. Placement of elements should not control the furnace size, since thermal efficiency is the controlling factor. Experiments have proved that the transverse section of heating elements should be round and that exposed elements should preferably be placed in corrugated grooves. Voltage should not be the determining factor in the selection of elements. To assure long life the total weight of the heating element should be high in proportion to the weight of the charge. In addition, the efficiency of the heat insulation must be adapted to the work to be performed.

Electric Steam Generators

In general the cost of electrical energy is such that it cannot be used commercially for the production of steam, but there are circumstances under which the conversion of electricity into steam even on a large scale becomes economically feasible. The required conditions, according to the paper of P. S. Gregory, are a surplus amount of electric power for which there is no other use at certain times or a cheap supply of power. On the basis of 4,840 kw.-hr. being equivalent to one ton of coal, 1.65 mills per kilowatt-hour could be paid for electrical energy if coal cost $8 delivered under the boiler.

In the steam generator described by the author energy is made to flow through the water from a central electrode to the shell of the vessel or to a metallic inner lining. Alternating current is used at a pressure varying from 110 volts up to 12,000 volts. Three electrodes can be used in one vessel or each electrode can be housed in a separate vessel and the three shells connected in star.

The chief advantages of the water-resistance type of steam generator over the metallic-resistance type, as outlined by the author, are freedom from electrical and mechanical troubles, ease of regulation and cheapness. Considerable of the steam pressure is accomplished by means of a float valve which will adjust the water level so that for a particular conductivity of water the steam supply will be equal to the demand, the depth of immersion of the electrodes determining the amount of energy released within the boiler. The danger of an arc striking between one of the electrodes and the wall of the vessel has been avoided in two ways—by the use of an inner protective shell and by the development of a potential-balance relay system.

Eric A. Lof, recently returned from a trip to Sweden, reported that hundred of electric steam boilers are in daily use in Europe, largely operated on surplus power. In Europe there are forty-two successful installations of that kind. Dr. Carl Hering inquired whether any appreciable decomposition of the water were discernible, due to electrolysis. Philip H. Falter of the Canadian Electro Products Company observed that electrodes wear out entirely out of proportion to the energy consumed. With twenty-five-cycle current there is greater electrode wear than at sixty cycles.

Crucible Furnace for Aluminum

A simple electric crucible furnace for melting aluminum was described by A. Glynne Lobley. It consisted essentially of a nichrome ribbon resistor wound in a helix and supported on thin firebrick shelves round the crucible but not touching it. Surrounding the heating element is a wall of kieselguhr and special bricks, held in a container of ordinary brickwork. Details of this furnace were presented.

Effect of Heat Treatment

According to tests made by Norman B. Pilling, a relatively high temperature (800 deg. to 900 deg. C.) is necessary for complete and rapid softening of electrolytically deposited iron. By annealing at 300 deg. to 400 deg. C. the initial hardness may be considerably increased. With the material investigated the scleroscope hardness was increased fron 26 to 45, the latter being equivalent to the hardness of an annealed high-carbon steel (1.2 per cent C.).

A New Induction Furnace

A new induction furnace was described by J. Murray Weed in which the electric current induced by transformer action occurs in a looped portion of the molten charge. This portion is distinct from the melting pot, in which the cold charge is received, melted and held for refining and pouring. The success of the furnace depends upon a continuous, automatic circulation of the molten metal between the secondary and the melting pot, to prevent overheating in the former and to deliver the heat to the cold metal in the latter.

Firing of Ceramics in Electric Furnaces

Properly designed electric furnaces can be depended on for ceramic firing at temperatures up to 1,100 deg. C., according to E. L. Smalley. Grinding wheels have been produced by the use of the electric furnace in a shorter time and of greater wearing durability than is possible in the kiln process. The cleanliness of atmosphere, the uniformity of temperature control and other features of electric furnace operation have made it very adaptable in the automobile and china industries and in the manufacture of glassware and bi-focal lenses, where substantial reduction in the percentage of rejects has been experienced.

L. E. Saunders pointed out that a commercial process for the electric firing of grinding wheels has not yet

been worked out. Organic binders for these wheels require but 100 deg. to 200 deg. C., and wheels with the sodium silicate binder are not heated above 250 deg. C. Professor Bancroft considered a small high-temperature electric furnace for porcelain firing a very desirable and welcome piece of apparatus. Artists could then fire their own china.

Certain types of varnishes are capable of developing substances of low electrical resistance during drying and oxidation, H. C. P. Weber pointed out. These substances are acidic, slightly volatile and may be shifted about and accumulated by temperature differences. In varnishes used for insulating purposes the amount of these substances formed during drying is of importance. Further work is necessary to determine the relation between the amount of these low-resistance materials formed and the composition of the varnish, the author declared.

The nature of gas emitted when insulating compound of high dielectric strength is subjected to arc action and the amounts developed per kilowatt-second were given in a paper by C. J. Rodman. From the data presented it appears that there is a consistent decrease in gas evolution per kilowatt-second with the increase in molecular weight of the paraffines. In both the halogenated aliphatics and aromatics there is a decided decrease in gas evolution per kilowatt-second as the halogenation increases.

Short-Wave Radio Transmission

EXCELLENT radio transmission has been obtained by using waves of 15 m. generated by thermionic valves giving a power of 200 watts and an aërial current of 1 amp. After a successful attempt over land, a test was recently made from Carnarvon, Wales, to a receiving apparatus on a boat running to Kingstown, Ireland, and speech was received in that harbor, 70 nautical miles from Carnarvon. It had previously been found that the diminution in strength of the received energy was greater at low levels than at high, and it was expected that greater distances than 70 miles could be covered under suitable conditions on land. The result of a test between Hendon and Birmingham, England, was very satisfactory, and it was proved that the effect of the use of a reflector at each end was to increase the received energy 200 times.

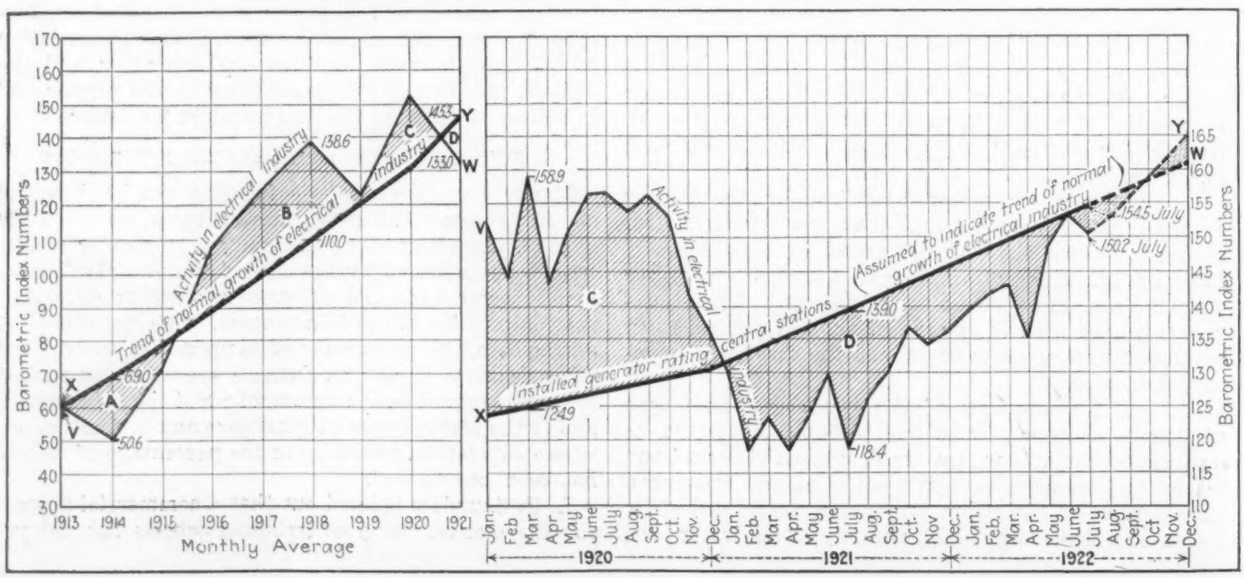
The work with experimental stations is to be continued, and the results have so far been such as to make it clear that this new method of direction finding will certainly be developed further. The use of small wave lengths precludes the likelihood of interference from disturbance, but it introduces some difficulties in tuning of the receiving circuit.

Rate of Business Progress Slackens During July

INDEX figures upon which the "Electrical World Barometer of Business Conditions in the Electrical Industry" is based indicate that during July activity within the industry as a whole was slightly below that during June. As indicated for June, a part of the falling off was no doubt due to seasonal slackening, but more potent causes were the long-continued coal strike and the uncertainty connected with the railroad difficulties. In addition, building contracts let during July declined about nine million square feet, being reported as 51,705,000 sq.ft., the lowest figure since last April. Some of the large users of electrical energy and electrical supplies, such as the textile, rubber, paper, brick and automobile industries, reported decreased activities during July. Preliminary figures for July indicate, also, that the operations of the electric light and power branch of the industry were about 4.2 per cent under those of June. It must be remembered, however, that the central-station output during June was far above any previous record, and a slight decrease during July was to be expected.

The "Electrical World Barometer" indicates that during the month of July business conditions in the electrical industry, taken as a whole, showed a decrease of 2.4 points on the barometer scale. The electrical industry as a whole during July was operating at 4.3 points below what would have been the point of seasonal demand if growth in the industry had been normal. In June it was operating at only four-tenths of a point below the point of normal demand.

ELECTRICAL WORLD BAROMETER OF ELECTRICAL BUSINESS CONDITIONS



Letters from Our Readers

A Place Set Apart for Suggestions, Comments and Criticisms, to Which All Men of the Electrical Industry Are Cordially Invited to Contribute

Danger from the Fused Neutral

To the Editors of the Electrical World:

The editorial in the Sept. 16 issue of the *Electrical World* entitled "A Code Requirement That Courts Danger" brings out a very important point in connection with interior wiring. The hazard to life that resides in the fused neutral was brought quite forcibly to my attention when one of our city firemen met his death from this source. In this particular instance a small fire originated in the basement of a three-story rooming house and shortly after the flames were extinguished one of the firemen entered the basement to determine, if possible, the cause of the fire. At this time there was approximately an inch of water on the basement floor, and in some way he came in contact with a long cord extension in such a manner as to cause it to be wrapped around his neck. Because of the very low contact resistance which the wet basement floor presented, and also because of the manner in which the cord (with insulation burned off) was entangled about his neck, an abnormal current flowed through his body to ground. Unsuccessful attempts were made by those present to disentangle him from the wire, and it was only after a lapse of several seconds that the current was interrupted by breaking the connection at the socket.

A test was made on the afternoon of the same day to determine if the electrical conditions on this circuit were normal, and the results of this test indicated that the neutral was well grounded, which precluded any possibility of excessive potential due to a cross with a high-voltage circuit.

The insulation on the cord with which the fireman came in contact was, as already stated, completely burned off, resulting in a short circuit which blew the branch circuit fuses. It happened, however, that the fuses were of unequal capacity, consisting of a 10-amp. fuse in the neutral wire and of 20 amp. capacity in the outside wire, so that when the short circuit occurred the 10-amp. fuse in the grounded neutral was blown, leaving the outside leg still connected to the system. Therefore, the possibility of shock existed even though one of the wires was disconnected from the supply by the blown fuse.

From the standpoint of protection to life there is little doubt that the solid neutral from service to final outlet would prove the best. From the standpoint of fire hazard it is possible that some increased protection is afforded by having both wires of a branch circuit fused. This is true, of course, only in the case that a short circuit occurs between wires. Should the short circuit occur from the outside wire to ground, no additional protection is afforded by the neutral fuse. The usual argument in favor of the double fusing is the increased factor of safety, as short-circuit protection is provided even where one of the fuses has been doctored.

In connection with a revision of the rulings along this line, should such a revision be adopted by the underwriters, it would be well to standardize on a foolproof single-fused panel, one that would make it difficult to insert pennies or to use other methods of bridging the lighting cut-out. It would also be advisable to standardize the lighting circuit panels with 0-15-amp. cut-outs, as the present practice tends toward excessive overfusing of branch circuits inasmuch as it is a very easy matter to replace fuses of the proper size with others of 30-amp. capacity.

I am very much interested in the question of the solid neutral and should be glad to see this matter discussed in your columns.

L. W. GOING,
Chief Electrical Inspector.
Department of Public Works,
Portland, Ore.

Laminated-Frame Arc-Welding Generators

To the Editors of the Electrical World:

In one of your recent issues a letter appeared from a Milwaukee reader who questioned the benefits derived from a laminated yoke in direct-current electric arc-welding generators. It is believed that a few points were overlooked in his discussion of this subject.

The statement that laminated frames permit a very rapid change of flux density, which in turn makes it possible for the arc current to adjust itself almost instantly to any demand, is quite correct in that the damping effect of eddy currents is almost entirely eliminated, thus allowing the change in terminal voltage to take place almost instantaneously with the change in flux density. Thus, in a differentially wound generator, with an increase of arc length or resistance there is a corresponding increase in effective flux density, causing a proportional increase in arc voltage with reduced arc current, so that the product of the arc volts and amperes remains practically constant throughout the welding range of 16 to 22 volts. The statement then applies to the so-called "variable-voltage, constant-energy" generators and not to "constant-current" generators as indicated in the letter which is under discussion.

The main purpose of the reactor in the arc circuit is to aid the operator in starting his arc by preventing a sudden inrush of current upon shorting the electrodes and causing what is commonly known in practice as "freezing" the electrode to the work. The damping effect of eddy currents in the cast yoke is not sufficient to get the desired results, and, besides, it would be an inefficient way of obtaining this desired condition, as both hysteresis and eddy-current losses are greatly increased. It is true that the time constant (L/R) should be made quite large in order to derive all possible benefit from this source.

The hysteretic coefficient η of ordinary annealed sheet iron is 0.004, while that of cast steel is 0.12. From the Steinmetz formula $W_h = \eta V B^{1.6}$ (where W_h = hysteresis loss in ergs, V = volume of iron in cubic centimeters, and $\pm B$ = range of flux density during complete magnetic cycle), we note that the actual hysteretic core loss of cast steel is practically thirty times that of sheet iron. This is one of the main advantages of the completely laminated magnetic circuit.

The eddy-current loss is proportional to the volume of iron or steel, to the square of the number of magnetic cycles per second, to the square of the thickness of laminations, and to the square of the maximum flux density, i.e., $W_e = V f^2 t^2 B^2$.

Here again we see the big advantage of using the laminated frame in preference to the cast yoke, since the eddy-current core loss in the laminated structure is only a very small fraction of that found in the cast frame.

In conclusion, it is observed from the foregoing that by using completely laminated magnetic circuits in the designing of arc-welding generators the core loss is reduced to a minimum, and the high efficiency of the equipment is maintained by using a proper design and size of reactor in the arc circuit (all laminated construction), thus reducing all possible loss in the external circuit. In no case has it been found possible to eliminate the stabilizing inductance in the arc circuit on differential-wound generators with satisfactory operation.

PLINY P. PIPES.

New York City.

Power-Factor and Property-Investment Methods of Charging for Power

To the Editors of the Electrical World:

Referring to the article in the *Electrical World* of May 6 by Messrs. Doran, Hodtum and Fryer on the kilovolt-ampere basis of charging for alternating-current power business and Professor Rittenhouse's comments and the reply thereto, in the issues of Aug. 12 and Sept. 2 respectively, it may be of general interest to show the following result of an analysis of the figures given in the original article. I have omitted, for the sake of brevity, the steps by which the figures were obtained, but they can be easily calculated by any one. For the sake of simplifying the comparison, I have also omitted the charge for losses under the property-investment method:

Customers Having Power Factor of (Per Cent)	Fixed Charge per Year for 2,800 Kw. "Power-Factor" Method	"Property-Investment" Method	Differences Between Methods	Per Cent Difference
100	$35,100	$43,500	$8,400	24.0
80	43,500	52,320	8,820	20.3
75	43,500	55,256	11,756	27.0
61	53,145	65,550	12,405	23.3
Increase due to low power factor.....	$18,045	$22,050		
Per cent increase due to low power factor.....	51.	51.7		

This shows that, with the rates assumed, the property-investment method would charge a customer having 100 per cent power factor with $8,400 more than would be charged the same customer under the power-factor method; furthermore, it will be seen that the percentage of increase in each of the rates on account of the power-factor penalty (omitting the losses) is almost exactly the same under the two plans.

The reduction in the amount charged at 100 per cent power factor under the power-factor method is due to the fact that this method offers a premium for power factors above 80 per cent, so that at 100 per cent it charges for only 2,240 kw. instead of the 2,800 kw. which is charged under the property-investment method.

This difference seems to add an unwarranted complication and to obscure the real effect of using the two methods, inasmuch as the above table shows that the 23 per cent increase pointed out by the authors as the result of using their method is really a little less than the percentage of difference between the charges at 100 per cent power factor. The result, consequently, is not so much due to the method used as to the basis of figuring.

There are two other points in connection with the property-investment method to which attention should be called.

The first is including a demand charge to cover losses. This is a comparatively minor feature, but if used should be used so as to operate equitably. I feel that the authors' method would not so operate, inasmuch as the ground for the imposition of an additional charge for decreased power factor is that the consumer is calling for excess capacity. If he pays for this excess capacity, I believe the losses should be figured on the assumption that the capacity paid for is supplied, and not on the basis of the original capacity.

The second feature is making a credit on the kilovolt-ampere charge against customers with low power factors on account of the fact that the steam end of the system is practically unaffected. In this connection attention should be called to the fact that an average ratio (e.g., 16-84 for steam and electrical investment respectively) would differ so materially from the actual ratio of large consumers that it is very doubtful if its use could be justified for all sizes. This difference is due to the fact that the kilovolt-ampere cost of connecting consumers to the generating station decreases with increasing size; hence, if with the average-size consumer the steam investment is 16 per cent of the total investment, then with a customer the size of the one in the example used (viz., 2,800 kw.), the ratio of the steam end would become very much greater owing to the decreasing cost per kilowatt of connecting so large a consumer to the generating station.

A. S. KNIGHT,
Consultant.

84 State Street,
Boston, Mass.

Italy's Electrical Industries

To the Editors of the Electrical World:

English and American capitalists and financial groups have on several occasions expressed the desire to invest capital in Italy's electric enterprises and especially in those utilizing their own water power. The Italian State Railways have already tried to control the water power of the country and to erect their own power stations. Their success would not be in the interest of the industrialization of hydro-electric developments.

The capital at the present time invested in the electrical industries of Italy amounts to about 2,000,000,000 lire. It controls 9,458 enterprises and produces 4,700,000,000 kw.-hr. per annum. The number of concessions amounts to 3,486, with a capacity of 1,702,000 hp. It has been calculated by experts that the total power obtainable will amount to about 6,000,000 hp.

Of course, such figures are only to be considered approximative. Taking into consideration the power stations now in operation and those to be completed within the next ten years, it will be safe to say that the total amount of electric power available will amount to 10,000,000,000 kw.-hr., equivalent to 20,000,000 tons of coal. This fact is the more remarkable when it is remembered that Italy in the year 1913, during which period the country consumed the largest quantity of coal ever used, imported altogether 12,000,000 tons of coal. The electrical energy now (September, 1922) directly available for the consumers amounts to 5,000,000,000 kw.-hr.

The largest enterprises are in the north of the country, where the industrial consumption is very large and where the streams flow much more rapidly than they do in other parts of the country.

HENRY L. GEISSEL.

Beaurivage, Thoune, Switzerland.

Industrial and Station Practice

Installation, Operation, Test and Repair of
Generating and Distribution Equipment and Methods of Economically Utilizing
Electrical Energy in Mills and Factories

Rural Line Costs Prorated on Mileage Basis

VARIATIONS in the cost of rural service depend upon the distances between customers and the length of serving lines. In a municipality fifty customers per mile is usually a minimum, while in farm service five customers per mile is a high average. It is readily seen, then, that this business is at a great disadvantage when compared with urban service. It means large costs per customer for extension lines, large transformer losses, high cost of service per customer, and small return per customer per mile.

The committee of the Ohio Electric Light Association on rural-line extensions has prepared the accompanying tables for assisting utilities in developing this type of service. Monthly costs for 6,600-volt rural service are divided in Table I according to transformer rating and number of customers per mile. The item of $1,100 as primary costs has been assumed from extended investigations merely as a starting point. The committee intended that this table should serve as a guide and did not mean to fix these costs on every rural installation without further study.

The Ohio plan of financing rural-line extensions is that they shall be built by the customer, then turned over to the utility, which will own and maintain them, charging regular urban rates for energy, plus a service charge sufficient to cover the maintenance, depreciation, taxes, operating costs and losses. The item "B" in Table I, which is subtracted from total primary cost, is merely a duplication of the urban secondary distribution costs. The monthly charge per customer for the various sizes of transformers is one-twelfth of the 10 per cent annual charge per customer, based on the total cost per customer. This charge does not include core losses. The core losses and the value of energy consumed by the core are given in Table II. Taking this added cost into consideration, we obtain Table III, which is the monthly rural-service charge for maintenance, depreciation, etc., plus the core loss. As may be seen, this table gives the charge for any number of customers per mile up to twelve.

Although the assumptions in Table I may vary in different localities, the methods of determining the service charge will be practically the same.

Without an extended study of these charges the use of electricity on the farm will be hampered by high rates and friction between the user and the utility.

FIELD EDITOR ELECTRICAL WORLD.
Chicago, Ill.

TABLE I—MONTHLY COST FOR 6,600-VOLT RURAL SERVICE, DIVIDED ACCORDING TO TRANSFORMER RATING AND NUMBER OF CUSTOMERS PER MILE

	Number of Customers per Mile					
	1	3	5	7	9	12
Total primary cost, assumed	$1,100.00	$1,100.00	$1,100.00	$1,100.00	$1,100.00	$1,100.00
Material, labor, etc., installing transformer	15.00	45.00	75.00	105.00	135.00	180.00
Service drops (100 ft.)	12.00	36.00	60.00	84.00	108.00	144.00
Total, item A	1,127.00	1,181.00	1,235.00	1,289.00	1,343.00	1,424.00
Direct credits equivalent to cost for urban customers:						
Transformers	4.28	12.84	21.40	29.96	38.52	51.36
Secondaries and services	17.50	52.50	87.50	122.50	157.50	210.00
Material, labor, etc. installing transformer	1.22	3.66	6.10	8.54	10.98	14.64
Total, item B	23.00	69.00	115.00	161.00	207.00	276.00
Total net cost without transformers (A—B)	1,104.00	1,112.00	1,120.00	1,128.00	1,136.00	1,148.00
Cost of transformers at 6,600 volts:						
1½-kw. transformer:						
Cost of transformer	54.00	162.00	270.00	378.00	486.00	648.00
Total cost	1,158.00	1,284.00	1,390.00	1,506.00	1,622.00	1,796.00
Cost per customer	1,158.00	428.00	278.00	210.80	180.50	149.80
Monthly charge per customer (10 per cent)	9.63	3.57	2.32	1.76	1.50	1.25
3-Kw. transformer:						
Cost of transformer	70.00	210.00	350.00	490.00	630.00	840.00
Total cost	1,174.00	1,322.00	1,170.00	1,618.00	1,766.00	1,988.00
Cost per customer	1,174.00	440.66	294.00	230.80	196.00	165.70
Monthly charge per customer (10 per cent)	9.78	3.68	2.45	1.92	1.63	1.38
5-Kw. transformer:						
Cost of transformer	85.00	255.00	425.00	595.00	765.00	1,020.00
Total cost	1,189.00	1,367.00	1,545.00	1,723.00	1,901.00	2,168.00
Cost per customer	1,189.00	455.66	309.00	246.00	211.00	181.00
Monthly charge per customer (10 per cent)	9.90	3.80	2.58	2.05	1.76	1.51
7½-Kw. transformer:						
Cost of transformer	102.00	308.00	510.00	714.00	918.00	1,224.00
Total cost	1,206.00	1,418.00	1,630.00	1,842.00	2,054.00	2,372.00
Cost per customer	1,206.00	472.66	326.00	263.20	228.00	197.80
Monthly charge per customer (10 per cent)	10.05	3.94	2.72	2.19	1.90	1.65
10-Kw. transformer:						
Cost of transformer	124.00	372.00	620.00	868.00	1,116.00	1,488.00
Total cost	1,228.00	1,484.00	1,740.00	1,996.00	2,252.00	2,636.00
Cost per customer	1,228.00	494.66	348.00	285.00	250.00	219.50
Monthly charge per customer (10 per cent)	10.21	4.12	2.91	2.38	2.08	1.83

TABLE II—VALUE AND AMOUNT OF CORE LOSSES FOR FIVE SIZES OF TRANSFORMERS

Size Transformer, Kw.	Core Loss, Kw.-Hr. per Year	Value at 2 Cents per Kw.-Hr.	Value per Month	Core Loss, Watts
1½	260	$5.20	$0.43	30
3	375	7.50	0.62	43
5	440	8.80	0.73	54
7½	665	13.20	1.10	76
10	790	15.80	1.32	90

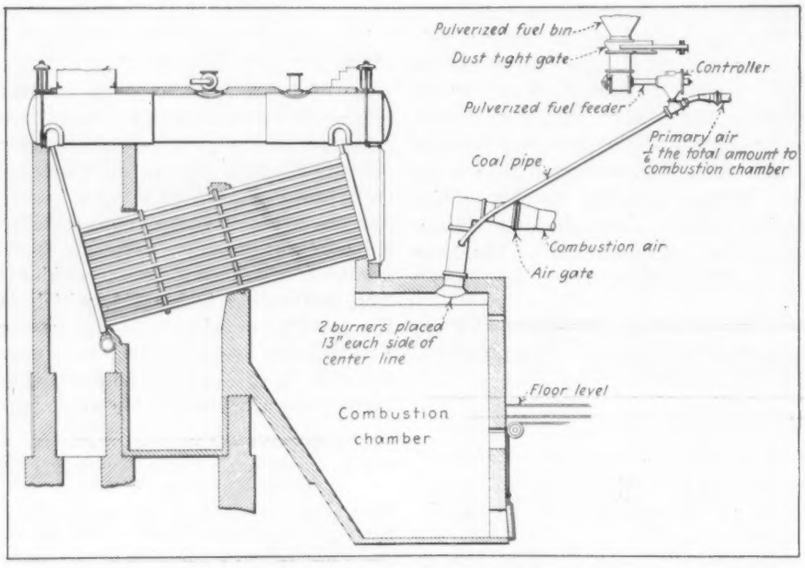
TABLE III—RURAL SERVICE CHARGE PER CUSTOMER PER MONTH

This is determined from the monthly charge for maintenance, depreciation, etc. (Table I), plus the core losses (Table II.).

Customers per Mile	Transformer Sizes				
	1½-Kw.	3-Kw.	5-Kw.	7½-Kw.	10-Kw.
1	10.06	10.40	10.63	11.15	11.53
2	5.50	5.82	6.05	6.57	6.97
3	4.00	4.30	4.53	5.04	5.44
4	3.21	3.53	3.79	4.28	4.68
5	2.75	3.07	3.31	3.82	4.23
6	2.44	2.77	3.10	3.51	3.91
7	2.19	2.54	2.78	3.29	3.70
8	2.06	2.38	2.62	3.13	3.54
9	1.93	2.25	2.49	3.00	3.40
10	1.83	2.15	2.39	2.90	3.30
11	1.75	2.06	2.30	2.82	3.22
12	1.68	2.00	2.24	2.75	3.15

Pulverized Waste Coal Efficiently Burned

A SERIES of conclusive tests on burning waste which have attracted considerable attention among French engineers have recently been completed by the Société des Mines de Houille de Blanzy, at Montceaules-Mines, France. The tests demonstrated that mine waste of not more than $\frac{1}{8}$-in. size, which corresponds in analysis to low-grade American anthracite or river coal, could be burned in pulverized form under boilers with a combined furnace and boiler efficiency ranging from 82 per cent to 85 per cent. These figures were obtained with a boiler not equipped with either superheater or economizer. The average analysis of the fuel, after drying, was as follows: ash, 29.2 per cent; volatile matter, 11.2 per cent; fixed carbon, 59.1 per cent; moisture, 0.5 per cent; B.t.u., 10,728 per pound; fusing temperature of ash, 2,120 deg. to 2,228 deg. F.



COMBINED FURNACE AND BOILER EFFICIENCY OF 82 TO 85 PER CENT ATTAINED WITH THIS PULVERIZED FUEL EQUIPMENT

The installation for the test consisted of one Babcock & Wilcox boiler having 2,368 sq.ft. of surface equipped with the Quigley powdered fuel system. Coal preparing and burning equipment consisted of one five-roller pulverizer, one drier, two powdered-coal feed controllers and two low-pressure burners at the combustion chamber with the necessary blowers for supplying air and for carrying the coal from the powdered-coal feeders into the burners. The general layout and arrangement of the pulverized-fuel feeders and burners is shown in the accompanying diagram. The combustion chamber is 7 ft. 4 in. wide and has a volume of 1,500 cu.ft. The two burners were placed 13 in. each side of the center line of the furnace (26 in. apart on centers) with a slight tilt toward the rear. Placing each burner near the center and tilting was done to prevent scoring of brickwork.

To prevent air streams and eddy currents so frequently encountered with ordinary blast gates a specially devised gate for the combustion air control was used. In this gate the flow is controlled by two overlapping grids, permitting the air to occupy the entire area of the pipe instead of hugging one side when the gate is partly closed. The pipe diameter on either side of the gate is enlarged to compensate for the area occupied by the stationary grid.

The test conducted on this equipment consisted of an uninterrupted thirty-day run of 704 hours. During this period the hourly evaporation for each 10 sq.ft. of heating surface was 30.19 lb. of water per hour. Evaporation of from 36 lb. to 45 lb. per 10 sq.ft. was easily attained for periods of several hours at a time. The average evaporation for the entire test per pound of coal was $6\frac{3}{4}$ lb. of water.

For the first twelve days of the test the best method of operation and regulation was determined and, once having been attained, was maintained until the end without any difficulty. The hourly evaporation per 10 sq.ft. of heating surface showed an average of 30 lb. of steam, and the average evaporation per pound of fuel was 7.38 lb. of steam, which corresponds to an over-all efficiency of 82 per cent for furnace and boiler. For periods of more than forty-eight hours the evaporation per pound of fuel was maintained between 7.61 lb. and 7.65 lb., which is equivalent to an efficiency of 85 per cent.

During the whole time of the test the ash was extracted easily—partly in a state of dust and partly in a spongy and vitrified state. The smoke leaving the stack was light and of a clear color and caused no deposit of dust in the neighborhood or surroundings of the installation. After cooling off, the combustion chamber was found in good condition and ready to operate again without requiring any repairs whatever. Considering the high efficiencies obtained, this speaks very highly for the installation of the combustion chamber.

EDWARD BRITT,
Resident Engineer.
Quigley-France Company,
Monceau-les-Mines, France.

Preservation of Red-Cedar Poles Advocated

THE preservation of red-cedar poles was discussed at the recent New London convention of the New England Division of the National Electric Light Association by E. L. Clark of Minneapolis. Mr. Clark pointed out that the supply of red-cedar poles is adequate for some years, but that high transportation charges have for some time militated against their wider use in New England and other Eastern districts. The best red cedar is obtained from the so-called Rocky Mountain area, embracing Idaho, Montana, British Columbia and eastern Washington. There being from twelve to sixteen rings per inch in the Rocky Mountain cedar as against four to seven rings in the coarser cedar from the Puget Sound district demonstrates the superior qualities of the former. The high-land cedar also seems to give the best results. The present freight rate on a 40-ft. pole to New England is about $8 on a class B pole, or about half its total cost. This means about 87 cents per 100 lb. from the producing section to the East. As to the specifications on red-cedar poles, good progress is being made by the Western Red Cedar Association in conjunction with the National Electric Light As-

sociation and the American Telephone & Telegraph Company.

The importance of building for permanency by treating poles was emphasized by Mr. Clark. "We have been treating poles for fifteen years," he said, "and not yet have we found a pole showing any sign of decay at the ground line. An untreated pole costing $20 might have a useful life of fifteen years and its annual cost would be $1.34, including depreciation. A treated pole costing $4 more, or $24, would last thirty years, and the increased life would reduce the yearly cost to $1.04, interest being computed at 6 per cent."

Several methods of treatment were then outlined:

AA. Treatment with creosote (A. T. & T. standard), short-time dip, fifteen minutes, hot oil just below the boiling point.

A. Treatment with carbolineum, fifteen-minute dip.

B. Treatment with grade No. 1 oil, four hours hot and two hours cold, after seasoning.

"Pentrex" treatment (½ in. or ¾ in. guaranteed penetration) by puncturing process.

TREATED POLES WHEN WET SHOULD NOT BE PAINTED

In the "Pentrex" treatment the oil is forced into the pole whether it is green or dry. However, in this process the poles must not be painted until they are absolutely dry or sap rot will follow. In one case half the poles of a sixty-thousand-dollar order were damaged by sap rot because they were painted before they were dry. For painting poles a good shingle stain of dark green is useful as this leaves the pores open so that the preservative is readily absorbed.

The value of poles of good appearance, especially in the red-cedar variety, was brought out by W. H. Cole of the Boston Edison company. Long life saves the expense of transferring overhead-line construction from old to new poles.

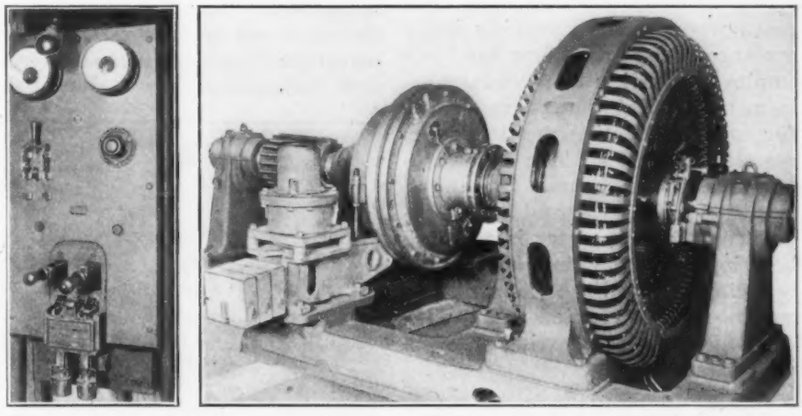
Mr. Clark then pointed out that red-cedar poles offer a superior footing for linemen's spurs. In treating poles of this kind it is desirable to get away from a pitchy oil, the carbolineums being better than most other oils for this purpose. Portable treating outfits have failed in many cases in giving proper treatment at the ground line.

FIELD EDITOR ELECTRICAL WORLD.
Boston, Mass.

Synchronous Motor for Heavy Duty

Magnetic Clutch Brake Allows Large Starting Torque and Gives Quick Stop in Emergency—Interlocked Control Insures Proper Sequence of Operation

SYNCHRONOUS motors have successfully met all starting and running conditions imposed upon them by such machines as air and ammonia compressors, fans, blowers, centrifugal pumps and many other similar applications. Only recently, however, has attention been given to the driving of machines by synchronous motors where excessive starting or pull in torque is required. It was usually cheaper and less complicated to drive such machines by a motor which would develop the required torque. Consequently an incentive had to be provided to bring about the use of synchronous motors in places where they would not ordinarily be considered. This incentive is now being supplied by the power companies in the form of decreased rates for improved power factor. In many cases the saving that may be effected in the monthly bill is so great that the entire investment charges of the synchronous installation may be paid for in two or three years, and sometimes much less.



WHERE POWER-FACTOR CORRECTION IS REQUIRED AND HEAVY LOADS ARE TO BE DRIVEN A SYNCHRONOUS MOTOR SET IS ADVANTAGEOUS

Left—Starting and control panel for synchronous motor unit. Right—Synchronous motor with magnetic clutch brake and pinion for chain drive.

By far the greater part of the mill lines in rubber factories are now driven by wound-rotor induction motors either coupled to gear reductions or connected by chain to the line shaft. Some motors of 150-hp. capacity are used, but most of them are between 250 hp. and 600 hp. and usually operate at speeds from 450 r.p.m. to 600 r.p.m. Low-speed synchronous motors have been installed by some of the larger rubber companies, and these were connected to the mill shaft through magnetic clutch brakes; but the gear or chain reductions are still used by most companies. The accompanying illustration shows how the problem of mill line drive and power-factor correction was solved for one rubber mill. The synchronous motor is rated at 250 hp., three-phase, 440 volts, 60 cycles, 100 per cent power factor, 450 r.p.m., but it is expected that the average mechanical load will be considerably less than the above rating and that the excess capacity will be available for power-factor correction.

Between the motor bearing and the next pedestal bearing is installed a Cutler-Hammer 36-in. magnetic clutch brake. This makes it possible to start the motor without load and then accelerate the mill line by means of the clutch. The brake is required to give a quick stop in case of emergency, and it disconnects the motor from the mill line, bringing the latter to a quick stop. It has been found that to give best service these clutches must be carefully installed and aligned. This is often not the case in small plants, or if the object is originally obtained, changes in alignment may occur later through wear or settling of foundations. To eliminate the difficulty encountered

when one-half of the clutch is pressed on the motor shaft by the motor manufacturer and the other installed by the customer on his shaft, the bedplate was extended and two additional pedestals with extra shaft were installed as shown in the illustration.

A similar combination, except that there is a pulley for belt drive instead of chain drive, and that there is no brake, is being supplied to drive a tube mill and also correct power factor. Such outfits could be used to advantage in many industries where power-factor correction is required and heavy loads are to be driven. The magnetic clutch makes it a very simple matter to start and stop the driven machinery from a distance or to leave the motor running idle as a condenser at times, if desired. In some cases where widely varying loads are encountered a scheme has been employed of using two overload relays, one set at the desired value for motor protection and the other set slightly lower. The latter one operates either to open the clutch circuit or to light signal lamps, indicating that the motor is about to be tripped off the line, so that by reducing the load the motor circuit may not be interrupted and the inconvenience of restarting may be eliminated.

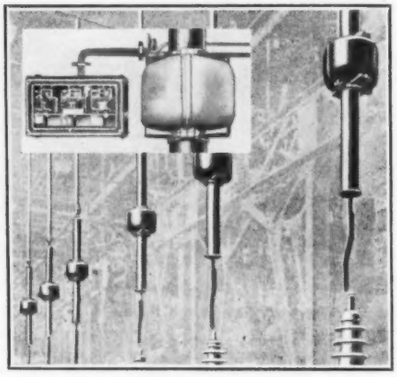
PROPER SEQUENCE OF OPERATION BY SUITABLE INTERLOCKS

Besides combining the mechanical apparatus as shown, it is also possible to combine and interlock the starting equipment for the motor and that of the clutch and brake so that they must be operated in the proper sequence. For instance, the starting equipment for the rubber-mill motor consisted of a standard synchronous motor panel (shown at the left) with double-throw oil circuit breaker, double-throw field-discharge switch, field rheostat and necessary meters. The clutch is operated by means of a push-button and contactor mounted on this board, but these are so connected that it is necessary for the running breaker to be closed and the field excited before the clutch circuit is energized. This prevents attempting to start the motor with the clutch engaged, throwing load on the motor while it is running on the starting tap, or without field current, if the operator forgets to throw over the switch. The safety switches on the rubber mills disconnect the clutch only, while if the motor breaker is opened and the motor stopped either by overload or low voltage, the clutch is also opened, making it necessary to start again in the proper sequence. If desired, either because of the location of the apparatus or because an efficient class of operators is not available, full automatic starting equipment may be used.

C. W. DRAKE,
General Engineer.
Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Protective Apparatus for 60,000-Volt Cable

GREAT importance has been attached to an efficient method of protection for the high-tension cables which have recently been installed in and around Paris, according to the *Electrical Review*. At the new Gennevilliers power station the current is transmitted by 60,000-volt cables to the surrounding substations. The cables are run in duplicate, and in view of their importance with respect to continuity of service, the protective apparatus must be sensitive to fault currents, absolutely discriminative, and must possess maximum stability.



CABLE PROTECTIVE APPARATUS IN THE GENNEVILLIERS STATION

Transformer and relay equipment is shown in the "insert," while the installation of the transformer in the switch house is shown in the other part of the picture.

These factors have been realized by the engineers who have designed the Gennevilliers station and who have adopted the protective apparatus for the high-voltage cables shown in the accompanying illustration. The problem of design presented greater difficulties than in previous cases since more sensitive operation was required than had hitherto been necessary. Besides this the apparatus was required to be perfectly stable when heavy "through" currents were passing. These requirements have been made simpler by the use of the compensated pilot, in which the capacity current in the pilot is rendered ineffective. Improvements also in the manufacture of the balancing transformers have assisted in obtaining the necessary stability. The transformers are of such dimensions that efficient protection can be given for feeders 50 miles or more in length. The type of transformer that has been adopted and the relay are shown in the "insert" of the illustration, while the installation in the switch house at the Gennevilliers station is shown in the other part. The sensitive relay controls the large circuit breakers near by. It will be noted that the transformers are inclosed in metal cases and are constructed in a thorough and robust manner. Experience has already been obtained with this apparatus under fault conditions, and in each case the damage has been negligible, consisting of a small burn through the insulation of the cable. The damage was very easily and quickly repaired and the feeder recommissioned within a few hours.

FIELD EDITOR ELECTRICAL WORLD.
New York, N. Y.

Strip Charts Preserved by Folding

THE construction of a reel for winding the strip-type charts used in a curve-drawing meter was described in the *Electrical World* for Aug. 19 on page 381. This company does not attempt to preserve strip charts in roll form as they not only take up too much room in this form, but it is very hard to find any particular date without unrolling a great deal of chart. We therefore fold these charts in sections of eight hours each, starting with midnight. The charts are so folded that when lying flat it is possible to handle them much in the same manner that the pages of a book are handled. The date is put in the upper left-hand and right-hand corners of each eight-hour section, and these sections themselves are again folded in the middle. It is then possible to open out any eight-hour section. Flat filing also takes up very much less space than roll filing.

LOUIS D. MOORE,
Electrical Engineer.
Missouri Pacific Railroad Company, St. Louis, Mo.

Central Station Business

Advertising, Selling and Service Methods
Commercial Organization and Management, Customer and Trade Relations, Public and Financial Policies, and Reports of Company Plans and Experiences

The Chicago Railways Power Contracts*

Rates and Terms of Agreement Under Which the Commonwealth Edison Company Sells Energy to Entire Traction System

IN SUPPLYING all of the electrical energy for the operation of the surface and elevated lines in Chicago the Commonwealth Edison Company has in effect power contracts and rates with the various railway companies which embody many interesting provisions designed to meet the conditions presented in the operation of a great metropolitan traction system.

The sale of power by the Commonwealth Edison Company is based upon contracts made with the Chicago Railways Company and the Chicago City Railway Company. Similar contracts are in effect between the elevated railway companies and the Commonwealth Edison Company. In the early years of the rehabilitation of the railways such contracts were entered into, and power was sold under them until 1912 and 1919, when new contracts were made. In both cases these were made retroactive to Aug. 1, 1909. They involved several features not in the original contracts, such as a sliding primary and secondary scale, provision for change in rate with change in price of coal, provision for limitation of maximum demand in very cold weather, and changes in location of measuring the energy furnished. Subsequently additional contracts were made between the Commonwealth Edison Company and each railway company in which they mutually agreed to convert energy for the use of the other. These latter contracts involved only conversion and not the purchase and sale of energy.

In 1913 the Commonwealth Edison Company took over the generation of energy and operation of all substations of the elevated lines, these lines having been joined into one operating organization in 1911. By this arrangement it became necessary for the Edison company to furnish direct current to the elevated railways. It was also evident that economies would be effected if energy for the elevated roads could be secured from some surface railway substations, and some energy for surface railways from elevated railway stations. As a result of such an arrangement a very satisfactory power supply system has been developed. Its chief operating merits are its reliability and the elimination of overlapping territories in which are several independent systems of power supply.

Conversion Agreements

The power contracts and the conversion agreements result in several operating conditions which are interesting. These may be enumerated as follows:

1. Railway company buys alternating-current energy.

2. Railway company buys direct-current energy.

3. Railway company converts alternating current to direct current for Edison company.

4. Railway company operates joint substations with the Edison company.

In the first case the railway company owns and operates its own substations and purchases alternating-current power at the substation, under the terms of the contract.

In the second case the railway company purchases direct-current power from the Edison company at stations owned and operated by the latter. In this case the railway company buys the alternating-current power under the terms of the contract, and in addition pays for the conversion to direct current in accordance with the conversion agreement. The companies divide the operating expenses of the substation in proportion to the output used by each.

In the third case the railway company furnishes direct current to the Edison company from stations owned and operated by the railway company. The railway company receives from the power company only a conversion charge, as the alternating-current energy furnished to the substation for the Edison company is not included in the bill to the railway company. As in the second case, the operating expenses of the substation are divided in proportion to the output to each company.

In the case of joint substations now in operation the Commonwealth Edison Company owns the land and building and the machinery for its own output. The railway company owns the equipment for its own output and buys alternating-current energy from the Edison company. The operating expenses are also divided in proportion to the output of the two companies.

Primary and Secondary Charges

These contracts extend to the date of expiration of the railway company franchises, Jan. 31, 1927. The rates are composite, having a primary charge covering fixed charges on investment, taxes, insurance and depreciation based upon the maximum demand for energy, and a secondary charge proportional to the actual cost of production, comprising fuel, labor and supplies and based upon the energy actually used. Both of these charges have a sliding scale. That for the primary charge is as shown in the accompanying table.

PRIMARY CHARGE, BASED ON MAXIMUM DEMAND

	Per Kw.
Up to and including 30,000 kw. [maximum demand	$1.25
Over 30,000 kw. and including 60,000 kw.	1.00
Over 60,000 kw. and including 90,000 kw.	0.91¼
Over 90,000 kw. and including 120,000 kw.	0.87½
Over 120,000 kw.	0.83¼

The secondary charge is, monthly, up to and including 5,000,000 kw.-hr., at the rate of 0.4 cent per kw.-hr.; over 5,000,000 kw.-hr. and up to and including 10,000,000 kw.-hr., 0.395 cent per kw.-hr., and then reducing by 0.005 cent per kilowatt-hour for each additional block of 5,000,000 kw.-hr. or fraction thereof, to a

*From an article in *Electric Railway Journal* by Ralph H. Rice, principal assistant board of supervising engineers, Chicago Traction.

minimum of 0.36 cent per kilowatt-hour for all energy above 40,000,000 kw.-hr. per month.

DETERMINATION OF DEMAND

To ascertain the monthly maximum demand, the Commonwealth Edison Company selects any three consecutive days and takes the maximum hourly demand during the morning and evening peaks for these three days. The average of these six peaks is taken as the maximum demand. The three days which produce the highest maximum are selected. The maximum demand as thus determined becomes permanent until exceeded by a larger one. A new maximum established in the winter months holds over the succeeding summer period when the actual demand is much less.

The computation of the maximum demand is somewhat involved as it is evident there may be several maxima. These are:

A. The main alternating-current maximum at railway company stations or joint substations, due to purchase of alternating-current power.

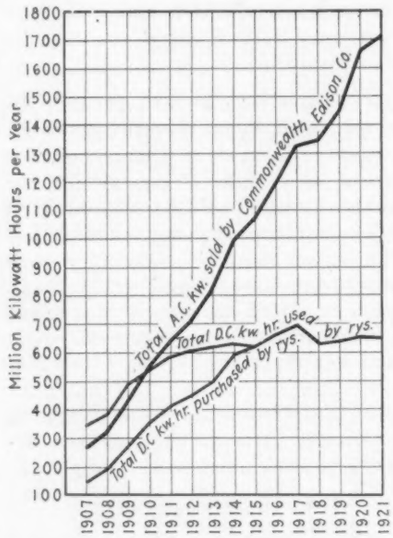
B. The alternating-current maximum due to the direct current purchased by the railway company at Commonwealth Edison Company stations.

C. The alternating-current maximum due to energy converted for the Commonwealth Edison Company at railway substations.

The maximum demand upon which the primary charge is paid, or the "billing maximum," is the total resulting from adding A and B above and deducting C. This result is the total demand by the railway company for energy used by it. In determining this the three successive days which produce the greatest resultant total are selected, and of course the values of A, B and C are simultaneous maxima. But the cost of conversion to be paid by the railway and the Edison company is based upon the actual maxima required for conversion, and these may not be the same in amount or coincident in time with the values used in determining the billing maximum for alternating-current energy as previously explained.

There is one condition which may affect the primary rate and one which may influence the secondary rate. When the temperature falls to 15 deg. F. or lower, the excess over the previously established maximum is not to establish a new maximum to be paid for at the above primary rates, but the excess is to be paid for at the rate of 25 cents per kilowatt per day.

The secondary cost is dependent upon the cost of coal, and this is recognized by a provision in the contract that when the price of coal exceeds $1.90 per ton delivered there shall be an increase in the secondary charge and if the price falls below $1.40 per ton there shall be a decrease in the secondary charge. This adjustment may be made every two years. The amount of adjustment in dollars is obtained by dividing by 1,000 the number of kilowatt-hours used during the two year period and multiplying the quotient by the difference between the average coal price and $1.90, if an increase, and $1.40, if a decrease.



ENERGY USED BY RAILWAYS AND TOTAL LOAD OF COMMONWEALTH EDISON

The kilowatt-hours sold have reached the enormous total of 1,700,000,000 per annum, of which amount 770,000,000, or 45 per cent, are for railway use. In 1907 both the railway and total loads were much less and the railway load was then 55 per cent of the total. The decrease in per cent has been due to the steady growth in the retail and wholesale light and power loads. Conversion losses are not included in the railway load. Only the net direct-current kilowatt-hours used are shown.

The conversion agreement stipulates that both the railway company and the Edison company shall pay for conversion from alternating-current to direct-current on the basis of 23 cents per kilowatt up to and including 10,000 kw. and 18 cents per kilowatt for all in excess of 10,000 kw. This is a conversion charge only and does not involve the initial cost of the energy. The Edison company owns and operates all high-tension lines between power houses and substations. Meters are placed at each substation on the incoming high-tension lines for measuring the maximum demand and consumption, and all alternating current energy is purchased by the railway company upon the basis of readings of these meters.

DIVISION OF OPERATING EXPENSES

In stations furnishing energy to both the railway company and the Edison company the operating expenses each month are borne jointly by the two companies, the division being determined by the energy received by each. If the output of the station is all direct current, divided between surface lines and Edison company for elevated railway use, then the division of expense is made simply on the basis of kilowatt-hours delivered to each. However, if the output is direct current to the surface lines and alternating current of a higher voltage to the Edison company for general power purposes, then the division must be made on the basis of equivalent alternating-current energy. The railway output in direct-current kilowatt-hours is divided by the efficiency of conversion to get the equivalent alternating-current kilowatt-hours. The actual efficiency of conversion for each station is used, which averages 93 per cent. The output to the Edison company is likewise divided by a conversion factor to reduce it to an equivalent alternating-current value. From some stations energy is furnished to the surface lines, to the Edison company for elevated railway use, and to the Edison company for general power purposes. In such cases the railway company pays its share of the operating expense resulting from the division as outlined.

The portion of the total load used by the railways, converted to direct-current kilowatt-hours, is shown in the accompanying curve. It will be noticed that the railway load in 1907 exceeded the total of the Commonwealth Edison Company. At this time and up to 1915 the railway companies generated a portion of their own energy. The lower curve shows the kilowatt-hours purchased from the Commonwealth Edison Company from 1907 to date. The difference between the curves represents the energy produced by the railway companies in their own stations. In 1915 the last railway generating station was shut down, and from that date on the two curves coincide. This railway load is the largest of its kind carried by any one central-station system in the world.

New Battery Service Rate at Hartford

TO FIT the cost of battery service more closely to the use of electric trucks in different kinds of service, the Hartford (Conn.) Electric Light Company has established a revised rate embodying an ampere-hour adjustment charge above or below the regular monthly mileage bill. The monthly mileage bill is now subject to decrease or increase at the rate of 8 mills for each ampere-hour used below or above the following basic ampere-hours per mile: 4, 6, 8, 10 and 12, corresponding to trucks of the following sizes: 1,000 lb. and under, 1, 2, 3½ and 5-ton equipments. This arrangement requires the truck user who imposes unusually severe service upon the battery, as in coal deliveries, to pay relatively higher prices for his service than the user who is able to handle his equipment with comparatively easy demands as compared with its capacity. In a sense the ampere-hour charge corresponds somewhat to a coal-charge adjustment as applied to electric power rates.

The base prices for battery service at Hartford are twofold. There are fixed charges per year as follows on battery service contracts: For trucks of 1,000 lb. capacity or less, $470; 1 ton, $570; 2 tons, $670; 3½ tons, $770; 5 tons, $870. These amounts are payable in twelve equal monthly payments, with discounts as stated below.

There are also mileage charges billed monthly as follows:

	Cents per Mile				
Truck Size	Up to 1,000 Lb.	1 Ton	2 Tons	3.5 Tons	5 Tons
First 250 miles per month	7	10	12	16	18
Next 250 miles per month	6	8	10	13	15
Excess	5	6	8	10	12

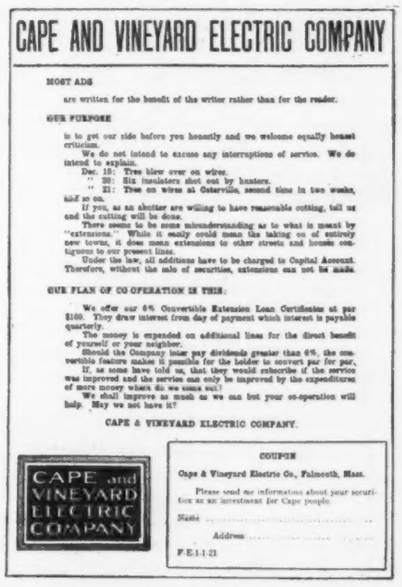
The ampere-hour adjustment is given above, and the discounts from the fixed charge part of the bill are as follows:

To all customers there is payable at the end of the contract year a discount of 2 per cent of the yearly fixed charge if the total number of contracts in force among all customers exceeds fifty; this increases by 0.5 per cent for each multiple of ten above fifty contracts in force. In addition to the above, for customers operating more than one truck there is a discount of 0.5 per cent of the yearly fixed charge for each contract above one which the customer has in force at the end of the contract year, up to a total of twenty contracts.

Space rates for trucks of the foregoing sizes in connection with battery service contracts are $110, $110, $120, $130 and $140 per year. Greasing service costs $75 per year in connection with battery service and space contracts, and washing service weekly in the foregoing connection is $50 per year. Batteries are the property of the Hartford Electric Light Company, and all trucks operating under the new rates will be equipped with ampere-hour meters. W. M. Thayer is manager of the battery-service department.

Making Operating Troubles Help Security Sales

DUAL-PURPOSE advertising by the Cape & Vineyard Electric Company of Falmouth, Mass., as illustrated herewith, appeals to the desire of the local public for uninterrupted service and exemplifies the company's desire to share its financial development with the communities reached by its lines. Eugene Carpenter, treasurer of the company, took the interruptions of service due


CAPE AND VINEYARD ELECTRIC COMPANY

MOST ADS

are written for the benefit of the writer rather than for the reader.

OUR PURPOSE

is to get our side before you honestly and we welcome equally honest criticism.

We do not intend to excuse any interruptions of service. We do intend to explain.

Dec. 19: Tree blew over on wires.
" 20: Six insulators shot out by hunters.
" 21: Tree on wires at Cotuit, second time in two weeks, and so on.

If you, as an abutter are willing to have reasonable cutting, tell us and the cutting will be done.

There seems to be some misunderstanding as to what is meant by "extensions." While it easily could mean the taking on of entirely new towns, it does mean extensions to other streets and houses contiguous to our present lines.

Under the law, all additions have to be charged to Capital Account. Therefore, without the sale of securities, extensions can not be made.

OUR PLAN OF CO-OPERATION IS THIS:

We offer our 6% Convertible Extension Loan Certificates at par $100. They draw interest from day of payment which interest is payable quarterly.

The money is expended on additional lines for the direct benefit of yourself or your neighbor.

Should the Company issue pay dividends greater than 6%, the convertible feature makes it possible for the holder to convert par for par.

If, as some have told us, that they would subscribe if the service was improved and the service can only be improved by the expenditures of more money where do we come in?

We shall improve as much as we can but your co-operation will help. May we not have it?

CAPE & VINEYARD ELECTRIC COMPANY.

CAPE and VINEYARD ELECTRIC COMPANY

COUPON

Cape & Vineyard Electric Co., Falmouth, Mass.

Please send me information about your securities as an investment for Cape people.

Name .....

Address .....

F.E.1-12-22

INVITING PUBLIC CO-OPERATION FOR BETTER SERVICE

to tree obstructions as a text for a short statement about more liberal policies by property owners in the way of trimming permits and from this starting point discussed the question of line extensions and the manner in which the public could insure more of these by participating in the company's financing through purchase of its extension loan certificates.

What Other Companies Are Doing

California—An appeal recently sent out by the California Electrical Co-operative Campaign to all members of the electrical industry in California urges the adoption of the term "convenience outlet" in all dealings within and without the industry. This means the use of the term on all advertising, bids, specifications, orders, shipping tickets, shipping marks, invoices, stock cards and other records and in all personal contact with the public or such mediums as engineers, architects, builders and real estate agents. In this connection the fact is of interest that the departments of electricity of the principal cities of California have given recognition to the term "convenience outlet," which appears repeatedly in the recently drafted rules pertaining to the installation of such outlets in homes and stores.

Seattle, Wash.—An "Electrical Week" promoted by the Seattle Electric Club was held in this city from Sept. 22 to 29 with two model electrical homes as the central features. Both homes were dedicated with appropriate ceremonies and are to remain open until Oct. 9. Harry J. Byrne was chairman in charge of arrangements.

Providence, R. I.—In the first three and one-half days of a customer's stock sale to new holders beginning Sept. 16, the Narragansett Electric Lighting Company received applications for 5,500 shares out of a total offering of 6,000. Since 1907 the number of stockholders in the company has increased from 1,140 to 7,600. The company now has 70,000 customers and customer-ownership is growing in favor. The company purchased the 6,000 shares mentioned in the open market and offered them to subscribers at a price to yield about 6 per cent.

Hartford, Conn.—To facilitate accounting for costs and to concentrate production activities, the Hartford Electric Light Company has created within the company a manufacturing division which will sell it energy at cost. The manufacturing division will be a distinct entity in itself to the extent of separate books, order blanks and stationery. The division has taken over the operation of all generating stations and the office of the system operator.

Digest of Electrical Literature

Including Brief Abstracts of and References to
Important Articles Appearing in the Scientific and Engineering Press
from All Parts of the World

Hydro-Electric Development and Steam Equipment

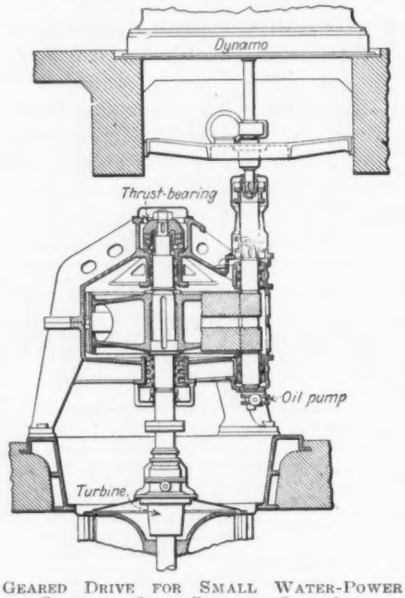
Geared Generator Drive for Water Turbines with Vertical Shafts.—E. TRIEBER.—The economic necessity of harnessing all available low-head water powers is frequently counteracted by the very high weight and cost of the low-speed, vertical-shaft turbine generator sets usually installed. The highly developed modern gear drive is a welcome solution of the problem thus presented. Vertical-gear sets with a ratio of 1:10 to 1:12 and a mechanical efficiency of 87½ per cent to 88½ per cent, interposed between the turbine and the generator, are coming into use and have already been installed in several plants for capacities of 200 hp. to 1,300 hp. The illustration on this page shows a drive for a turbine speed of 108 r.p.m. and a dynamo speed of 750 r.p.m. for 1,000 hp.—*Zeitschrift des Vereines Deutscher Ingenieure*, July 22, 1922.

Modern Condensing Plant for Leeds.—A description is given of the condensing plant for a 12,000-kw. turbo-generator at the Whitehall Road electric lighting station of the Leeds Corporation in England. The condenser is of special construction, arranged vertically, and is designed to deal with 220,000 lb. of steam per hour, while maintaining a vacuum of 28.5 in. To avoid the necessity of deep foundations or an excessively high engine house, the exhaust inlet has been arranged at one side and the condenser placed on the same level as the turbine.—*Electrical Times*, Aug. 24, 1922.

Rebuilding a Large Boiler Plant Without Interrupting the Service.—ALFRED IDDLES and J. WALTER MAY.—A description of the way in which a modern boiler plant containing five water-tube boilers, each of 4,900 sq.ft. of water heating surface, was built on the same location as an old, obsolete and overloaded plant containing seventeen hand-fired horizontal return-tubular boilers.—*Power*, Sept. 12, 1922.

Generation, Control and Switching

High-Tension Transmission System Protection.—Four papers are given on this subject, dealing mainly with the Petersen coil. T. Nishi, in a paper on "Abnormal Voltages and Protective Devices," describes the main causes of abnormal voltage in transmission systems and discusses some of the defects in the lightning arresters now in general use. K. Kato, in "Calculations Relating to Petersen Coil Problems," discusses the performance and computes the capacity of a coil for a 150,000-volt, 140-mile transmission line. S. Bekku gives two papers, "The Resonance Caused by the Petersen Coil" and "Petersen Earth Coil as a Remedy for Electromagnetic Inductive Interference." In the first he considers the danger of abnormal voltage caused by the unbalance of each phase when the neutral of the transmission circuit is grounded through a reactance. In the second paper Mr. Bekku gives a detailed description of the method used in the first paper to calculate the electromagnetically induced voltage of



GEARED DRIVE FOR SMALL WATER-POWER STATIONS GIVES SMALLER OVER-ALL DIMENSIONS (E. TRIEBER)

a telephone line by the accidental grounding of the power line.—*Journal of the Institute of Electrical Engineers of Japan*, August, 1922.

Hunting of Alternators in Parallel.—J. FISCHER-HINNEN.—Starting with the vector diagram of a machine driven by an internal-combustion engine and connected in parallel to other machines, the author shows that, in addition to the forced vibrations received from the driving engine, the synchronizing force causes the flywheel to swing at its natural frequency, and if the impulses from the prime mover have nearly the same period as the natural oscillations, the amplitude will increase and the machine fall out of step. The various phenomena that occur under these conditions are treated mathematically and a general case is developed.—*Electrician*, Aug. 18, 1922.

Power-Plant Management.—ROBERT JUNE.—In keeping performance records the compilation of unnecessary data is to be avoided and all records compiled should at all times be available to the men who control the figures which go to make up the records. Operating men should not be bothered with dollars-and-cents computations. In cases where the latter are involved the records should go through the accounting department, where the cost of the various items can be readily and expertly arrived at. Typical sheets are shown for daily operating logs, steam-plant report, daily report for men employed, water-softening and purifying-system report, boiler-house operation cost, etc.—*The Central Station*, September, 1922.

Transmission, Substations and Distribution

Energy Supply of Berlin from Outside Stations.—R. WICHMANN.—The insufficient capacity of the power stations of Berlin made it necessary to introduce into the city energy from one, and later from a second, generating station, each about 80 miles from Berlin near soft-coal mines. These stations are connected to substations on the outskirts of Berlin with double three-phase steel-aluminum lines operating at 110,000 volts. The author points out that a much larger amount of energy could be transmitted over these lines either by restoring their power factor to unity or by increasing the voltage to 150,000, or both, and gives complete electrical data and cost figures for each suggestion. At the end of the paper he gives an interesting tabulation of the itemized cost and all electrical data of the existing 80 miles of double line.—*Elektrotechnische Zeitschrift*, Aug. 7, 1922.

Economic Advantages of Power-Factor Compensation by Means of Phase Advancers.—W. SEIZ.—A very effective means of improving the power factor of a line consists in fitting a phase advancer in the rotor circuit of a slip-ring induction motor. The advantages of adopting a phase advancer, although entailing a supplementary outlay, are investigated by means of examples showing the savings that can be made. A brief comparison of the various methods of phase compensation is made.—*Brown-Boveri Review*, August, 1922.

Units, Measurements and Instruments

By Measurement of Current Used and Extended Records Large Savings Can Be Made in Power Cost.—Importance of cost records, need for more recording devices, specifications for contracts and the control of power factor are the features dwelt on in the report of the committee on methods of checking power costs presented at the convention of the West Virginia-Kentucky Association of Mine, Mechanical and Electrical Engineers held Sept. 19, 1922, at Huntington, W. Va. When a mine operates its own power station, totalizing plant watt-hour meters must be installed and accurate accounts kept of all items of expense such as oil waste, repairs, etc. In the

case of purchased power, superintendents should check the accuracy of the monthly power bills.—*Coal Age*, Sept. 28, 1922.

Distribution Photometer of New Design.—C. C. COLBY, JR., and C. M. DOOLITTLE.—No one photometer is preeminently best for all cases, but the authors describe a new type of photometer which embodies the good points of other types and some new features besides. In general, it is a two-mirror selector type with the lighting units suspended or mounted on the rotating head, which can be moved vertically to bring the light center to the proper position on the photometer axis. Light from the unit is reflected by the two mirrors on to a diffusing screen placed between it and the Lummer-Brodhun photometer.—*From a paper presented at the annual convention of the I. E. S., Swampscott, Mass.*, Sept. 25-28, 1922.

Illumination

Nomenclature and Photometric Standards.—Illuminating engineering nomenclature and photometric standards which were approved by the American Engineering Standards Committee as American standard on July 11, 1922, are presented in this paper. Seventy items are specified. Among the most interesting are radiant flux, luminous flux, mechanical equivalent of light, unit of exposure, hue, variation factor, output, lamp efficiency and visibility factors for different wave lengths.—*Paper presented at the annual convention of the I. E. S. at Swampscott, Mass., Sept.* 25-28, 1922.

Effect of Absorbed Gas on the Conductivity of Glass.—V. BUSH and L. H. CONNELL.—The article presents the results of experiments on the electrical properties of glass which were carried on during the last two years in the research laboratories of the Massachusetts Institute of Technology. These results show that gases, in particular water vapor, penetrate throughout the volume of glass and quartz and radically affect their volume conductivity. There is also a large change in the volume conductivity when the glass is heated in vacuum. Upon subsequent exposure to the air the resistivity decreases slowly, but does not reach its original value. A considerable improvement in insulating value or dielectric loss can be obtained by vacuum treatment.—*Journal of the Franklin Institute*, August, 1922.

Motors and Control

Steel-Mill Motor Failures.—ARTHUR J. WHITCOMB.—Owing to the severity of service and the peculiar operating conditions in a steel mill, a certain percentage of motor failures must be anticipated. The author shows the importance of keeping a detailed record of these failures and how a careful analysis of them has made it possible for the maintenance man to devise ways to reduce them in a large mill that operates 900 auxiliary motors ranging from 1/12 hp. to 300 hp. in a wide variety of applications.—*Industrial Engineer*, August, 1922.

Electric Motor Drive in Steel Industry.—GORDON FOX.—The author considers the rolling-mill requirements as to power, speed, adjustability and changing of speed, mill layouts to utilize electric power, the flow of metal under rolling pressure and its effect on power demand. The greatest advantages of electric drive are derived at the motor. The compact form, light weight and wide range of characteristics of electric motors permit their effective application to all classes of main and auxiliary apparatus. The general mill type of motors and motor characteristics best suited to their drive are outlined.—*Iron Age*, Aug. 10, 1922.

Heat Applications and Material Handling

Material-Handling Equipment as Used in the Iron and Steel Industry.—F. L. LEACH.—A description is given of the handling machinery and apparatus used in the manufacture of steel. From the time that the ore leaves the mines until the steel goes through the last process at the mill it is moved about exclusively by different types of heavy machinery designed especially for the purpose. This equipment is described with the idea of bringing out weak points in present-day practice and opening the way for strengthening the weakest links in the conveying methods used.—*Mechanical Engineering*, August, 1922.

Basic Electric Furnace Operation.—C. W. FRANCIS.—The author considers the grade of lime necessary, reduction and removal of phosphorus and sulphur, malleable and gray-iron castings, and the selection of voltage for the furnace.—*Iron Age*, Aug. 17, 1922.

Cleaning, Testing, Machining and Shipping in the Carbon Electrode Industry.—CHARLES L. MANTELL.—The finishing steps in electrode manufacture are considered in this concluding article on the technology of the carbon electrode industry. The author also discusses the factors affecting the properties of electrodes for use in electrolytic and electrothermic applications, the economics of the industry and the trend of developments.—*Chemical and Metallurgical Engineering*, Aug. 23, 1922.

Electrophysics, Electrochemistry and Batteries

A New X-Ray Diffraction Apparatus.—WHEELER P. DAVEY.—Many materials may be readily identified and their crystal structure determined with a high degree of accuracy by X-ray analysis. The apparatus described in this article has been developed to provide a convenient means for applying this laboratory method of analysis to general crystal research and factory-control work.—*General Electric Review*, September, 1922.

St. Paul Utilities Co-operate on Stray-Current Control.—O. J. LENMARK.—Results are given of the survey conducted by the Co-operative Committee of Utilities to determine the results of applying remedial measures in the prevention of electrolytic corrosion. These measures were suggested by the Bureau of Standards. The committee also studied the effects on electrolysis of changes in the distribution system and elimination of competitive drainage in underground structures.—*Electric Railway Journal*, Sept. 16, 1922.

Traction

Rotary Converters for 1,500-Volt Direct-Current Railway Service.—N. WIDMER.—A French railway, operating on 1,500-volt direct current, recently installed seven rotary converters which, the author claims, are the first of their kind. Three-phase current is used at 750 r.p.m. and 50 cycles. The normal constant load is 750 kw., with an 1,125-kw. two-hour overload capacity and a 2,250-kw. five-minute overload capacity. The no-load voltage is 1,650. It was required that the converters withstand five short circuits at one-minute intervals.—*Brown-Boveri Mitteilungen*, August, 1922.

Survey of Electric Traction on American Railroads.—GEORGE GIBBS.—The author describes and compares heavy electric traction systems now in service, outlines the trend of locomotive design and presents a tabular review of the present standard of freight and passenger locomotives. He also discusses overhead trolley and third-rail conductors, voltage limitation, substations, types of drive for locomotives, motor cars and choice of systems. The article is an abstract from the report made by Mr. Gibbs for the ninth congress of the International Railway Association.—*Engineering News-Record*, Sept. 14, 1922.

Telegraphy, Telephony, Radio and Signals

Transient Track Circuits.—The possibilities of transient track circuiting for railway signaling are stated to be considerable from an economical and safety standpoint. While many signaling problems can be solved by extensive use of track-circuiting, the cost of installation and maintenance is in many cases prohibitive. The principle of the transient system lies in the momentary application of current to the track, which, if occupied, will permit the current impulse to pick up a relay. It is claimed that complete immunity from stray current effects is obtained and that the alternating-current signaling current can be superimposed upon the track rails, which may already be carrying propulsion current.—*Electrician*, Sept. 1, 1922.

A Vacuum-Tube Alternating-Current Potentiometer.—E. C. WENTE.—A description is given of an alternating-current potentiometer which is suitable for the measurement of electromotive forces having frequencies up to 10,000 cycles per second. Both the phase and magnitude are read directly from the dial reading. A special differential galvanometer used with the potentiometer is also described.—*Bulletin B-5-1 of the Engineering Department, Western Electric Company.*

News of the Industry

Chronicle of Important Events and General Activities, Announcements and Reports of Association Meetings, Court Decisions and Commission Rulings and News of Electrical Men

Accounting Pact Likely

Concessions by Both Federal Power Board and State Commissioners May End Long Controversy

AS AN outcome of the conference in Washington on the accounting system to be prescribed by the Federal Power Commission for utilities coming under its control (see *Electrical World* for Sept. 30, page 730) the chief accountant for the Federal Power Commission has agreed to make a number of changes and modifications in the revised tentative draft of the proposed system which formed the basis for discussion at the conference. The representatives of the National Association of Railway and Utilities Commissioners agreed on their part to recommend important changes in and modifications of the proposed uniform system of accounts for electric utilities adopted by the association at its 1920 convention.

RECOMMENDATIONS TO BE MADE

The chief accountant of the Federal Power Commission will lay the following recommendations before that body:

"1. To insert in the revised tentative draft of the accounting regulation a clause to the general effect that the functional classification of non-project land and structures will not be required, but that if the licensee so desires all non-project land may be included in a single land account, and that all non-project structures may be included in a single structure account. So far as non-project land and structures are concerned the accounting is to be optional. As to project land and structures, to insert a clause to the general effect that where, in case of peculiar or unusual conditions, it seems impracticable to classify project lands and structures according to the prescribed accounts, licensees may bring the matter to the attention of the Federal Power Commission and that consideration will be given to permitting a special classification.

"2. To create another general group of fixed-capital accounts for certain transmission and distribution fixed capital, in which to include the cost of capital used jointly for transmission and distribution purposes where it is impracticable or undesirable to assign or allocate such costs to other specific transmission or distribution fixed-capital accounts.

"3. To make such other and further changes in, and correction and modification of, the other fixed-capital accounts and the general instructions relating thereto as were agreed to by the conference.

"4. To change the title and the text of certain balance-sheet accounts which are now in both drafts to agree with the title and text of the national committee's draft where the language used by the national committee clearly expresses the meaning intended to be conveyed, and further to make such changes in the balance-sheet account as were agreed to in conference. Unfinished construction is to be retained as a balance-sheet account and is not to be included among the fixed-capital accounts.

"5. To make such changes in the general rule or in any other rules or accounts as may be necessary to make it clear that nothing in the system of accounts for licenses is intended to relieve the licensees which are public utilities from conforming to all accounting rules prescribed by the state commission, including such rules as may be applicable to the project property or any other rule or regulation of the state regulatory body.

"6. To carry out in good faith all promises made during the conference as to changes in accounts and rules not specifically referred to, and to consider carefully the matters discussed concerning which no definite conclusion was reached or promise made.

"7. It is not proposed to depart materially from the general plan and general arrangement of the accounts as at present set forth in the revised tentative draft, but only to make such modifications of and changes in the accounts themselves as already have been indicated, preserving the general plan and arrangement in all material aspects."

New Plant for Chicago

Commonwealth Edison to Build One on West Side Besides Completing Calumet Station

THE directors of the Commonwealth Edison Company of Chicago on Oct. 3 authorized plans for an immediate enlargement of the company's Calumet station and the construction of a new plant on the West Side of Chicago. These developments are expected to take care of the growth of the city until 1925. The total cost of the plans added to that of the work already done on the Calumet station will exceed $53,000,000.

The enlargement to the Calumet station, which is the third section, comprising two 30,000-kw. units, will start immediately. The first section began operation two years ago, and the second section will soon be placed in service. When finished this station will contain six 30,000-kw. units, or a total of 180,000 kw. The building of the third section calls for an expenditure of $6,000,000, which brings the total cost of this station up to $21,000,000.

Plans for the new West Side plant have been drawn up. It will eventually contain eight 35,000-kw. units, or a station capacity of 280,000 kw. The initial installation will call for two of these units. This station will be built near the Drainage Canal, at Crawford Avenue adjacent to Thirty-ninth Street. This site of 67 acres was purchased several years ago by the Commonwealth Edison Company in anticipation of growth. It will be near the industrial center of the West Side, where there is a heavy demand for electrical energy.

A. M. E. S. Takes in Council

Offices Are Consolidated and Frederic Nicholas Succeeds C. E. Dustin as Secretary

ANNOUNCEMENT is made by the board of governors of the Associated Manufacturers of Electrical Supplies that, "as an important step in the program of economy and increased efficiency" felt to be necessary, the offices of the association and those of the Electrical Manufacturers' Council have been consolidated and are now established at 30 East Forty-second Street, New York. The office occupied by the council at 522 Fifth Avenue has been given up.

Charles E. Dustin has tendered his resignation as general secretary of the association and Frederic Nicholas, former secretary of the council, takes his place. In accepting Mr. Dustin's resignation the board of governors extended to him a vote of appreciation for his efficient work. In addition to Mr. Nicholas, officers of the association for the ensuing year have been elected by the board of governors as follows: President, S. L. Nicholson, Westinghouse Electric & Manufacturing Company; vice-president, William H. Thornley, Tubular Woven Fabric Company; treasurer, H. W. Bliven, Harvey Hubbell, Inc.

President Nicholson has invited the chairmen and secretaries of all sections of the association to meet at the association rooms on Monday evening, Oct. 16, to discuss the plan of industrial statistics drawn up by Secretary Hoover, the work of the Department of Commerce's division of simplified practice, the National Industrial Conference Board, the tariff and the underwriting situation.

West New York Conference

Electrical Men Meet for Two Days in Buffalo, Where They Are Guests of Local Companies

ELECTRICAL men from nearly a hundred communities of western New York State gathered on Thursday and Friday of last week for a "western New York electrical conference." The meetings were held at the Hotel Lafayette, Buffalo, with an attendance of more than six hundred. The conference was sponsored by the Niagara Falls Power Company, Buffalo General Electric Company, Niagara, Lockport & Ontario Power Company, Tonawanda Power Company, Niagara Electric Service Corporation, General Electric Company, Westinghouse Electric & Manufacturing Company, Western Electric Company, Robertson-Cataract Electric Company, McCarthy Brothers & Ford, H. I. Sackett Electric Company, Lloyd A. Wooley, Inc., and the Electric Club of Buffalo.

PURPOSE OF THE GATHERING

The purpose of the gathering was to picture the opportunity for business development and crystallize opinion throughout the region served by the great power systems of the Niagara frontier and to put forth a direct effort to apply through original local work the principles around which the industry is trying to build up a broad program of business promotion. The conference opened with a welcome from Mayor Schwab of Buffalo, a greeting from W. R. Huntley, vice-president Buffalo General Electric Company, and an address by W. E. Robertson, Robertson-Cataract Electric Company.

Then came an analysis of the "present and future" market by Earl E. Whitehorne, commercial editor *Electrical World*, in which he reduced the opportunity to the basis of a thousand average homes and showed the vast number of electrical appliances still waiting to be sold in every city. Three addresses followed by E. W. Minor, president Contract Purchase Company; C. L. Parsons, Jr., Commercial Credit Company, and F. C. Trubee, Morris Plan Bank, who explained in detail how the dealer may finance the sale of wiring and appliances on a larger scale under the easy-payment plan.

J. C. McQuiston, manager of the Westinghouse department of publicity, and C. S. Woolley, of Barton, Durstine & Osborne, talked on the function of advertising in local market development. Mr. McQuiston made a graphic point of the fact that modern selling is merely an evolution from the peddler and his pack. The need for taking the goods to the customer still exists in the same fundamental way, but merchants today have recourse to advertising, store-window display and other methods made necessary by the increase in the variety and volume of merchandise.

A TWO-ACT PLAY ON WIRING

A most interesting demonstration of the need for complete and convenient wiring and the ease with which it can be sold by the contractor who makes service and not price his object was given in a clever two-act play presented by three members of the local companies. This was the feature of the session on wiring presided over by A. K. Baylor and J. A. Corcoran, General Electric Company. The subject of power was discussed by George H. Jones, Commonwealth Edison Company, Chicago; S. Bennis, United Electric Light & Power Company, New York; A. C. Smith, Buffalo General Electric Company; Ken Parker, McCarthy Brothers & Ford, and D. F. Potter, Robertson-Cataract Electric Company, who presented the opportunities for business in many fields and in the changing over of private plants to central-station service.

Frank A. Coupal, commercial manager Buffalo General Electric Company; Julius Tuteur, president Electric Vacuum Cleaner Company, and Lloyd A. Wooley led the discussion of the appliance market, and the subject of lighting was covered by R. W. Shenton, National Lamp Works, and A. S. Turner, Jr., Edison Lamp Works, supported by a demonstration of lighting effects by D. W. Atwater, Westinghouse Lamp Company.

AMPLE ENTERTAINMENT PROGRAM

An unusual amount of hospitality and entertainment marked the conference. After luncheon on Thursday the entire company, as guests of the conference, motored to the River station of the Buffalo General Electric Company. There was a banquet on Thursday night, at which Charles R. Huntley, president Buffalo General Electric Company, was toastmaster and addresses were made by him, by George C. Lehmann, general secretary Buffalo Chamber of Commerce; Paul A. Schoellkopf, president Niagara Falls Power Company; George H. Jones, power engineer Commonwealth Edison Company; William L. Goodwin, of the Society for Electrical Development; Frederick M. Feiker, of the McGraw-Hill Company, Inc.; Fred D. Corey, president Niagara, Lockport & Ontario Power Company, and A. Monro Grier, president Canadian Niagara Power Company.

The conference ended with a trip to Niagara Falls and a visit of inspection to the American Niagara Falls plant. The visitors were served with dinner on the roof of this station, as guests of the Niagara Falls Power Company.

Early Electrical Inventions Shown in New York

Preceding by five days the opening of the annual New York Electrical Show, of which it forms a part, the Museum of Edisonia and the exhibit of historical electrical apparatus were opened last Monday at the Grand Central Palace. The Edisonia exhibit has been arranged as part of the celebration of forty years of Edison service in New York. Together with the noteworthy collection of apparatus illustrating some of the most important contributions of Thomas A. Edison to the field of science, it tells not only the story of the progress of the electric light from the pioneer arc-light days, but also the history of the growth of the successful incadescent electric lamp.

Conspicuous in the exhibit, of which the nucleus was exhibited at the St. Louis Exposition in 1904, are the William J. Hammer historical collection of incandescent lamps, 1878 to 1913; a collection of historical electrical apparatus contributed by the American Institute of Electrical Engineers, historical instruments and lamps loaned by Thomas A. Edison and donations and loans from universities, private corporations and individuals. The collection is exhibited under the joint auspices of the Association of Edison Illuminating Companies, the Edison Pioneers and the Electrical Show.

HISTORICAL EXHIBIT OF THE ELECTRIC LIGHTING INDUSTRY

Italy Seeking American Capital

Tax-Exemption Bill Brought In to Facilitate the Investment of Foreign Funds in Water-Power Projects—United States Capitalists May Invest $35,000,000

THAT the Italian government is anxious to bring about the immediate and increased exploitation of hydro-electric resources in Italy through the intervention of foreign capital is evidenced by a bill recently presented to the lower house of the Italian Parliament for the exemption from taxation of all bonds issued in foreign countries and in foreign money for the purpose of development of public utility works, including specifically hydro-electric plants and the electrification of railways.

Experts who have thoroughly examined the situation in Italy and studied carefully the investment of American capital in water-power and electric light and power systems operating in north Italy assert that conditions there are very satisfactory and that the immense supply of water provided by the Alps can ultimately make that section one of the most important industrial areas of Europe.

The main difficulty hitherto has been the double taxation to which foreign capital was subjected, that is, by the country whence the loan would emanate and also by the country in which the money would be placed for the increase of capital, payment of previous loans, additions to plants, construction of new power houses and completion of those already under construction.

The new bill clears the way for the entrance of foreign capital into Italy by construing as balance-sheet liabilities to be deducted from the taxable capital, and therefore to be exempt from taxation, the proceeds of loans issued abroad and invested in public utility works before Dec. 31, 1925.

By far the most important plan for the investment of American capital in Italian hydro-electric works is that now being negotiated by the firm of J. E. Aldred of New York conjointly with Lee, Higginson & Company of Boston and Dillon, Read & Company of New York. It is stated on good authority that about $35,000,000 will be invested by American capitalists in hydro-electric companies operating in the Piedmontese, Lombard, Venetian and Genoese regions, covering the whole of north Italy, which is considered as the richest field of exploitation of water power for industrial and domestic purposes.

The investment is said to be in the form of a loan to be issued on the New York market in thirty-year bonds, bringing a substantial interest and guaranteed by the actual value of the plants and machinery already in operation and of those well under construction, the value of which is held by experts as leaving a safe margin of security for the investors. The obligations, it is said, will be issued under the protection of the American and the Italian laws and with all the stipulations required for the protection of bondholders. Negotiations for the loan are now almost completed, and it is expected that definite arrangements will be made soon for the public issue.

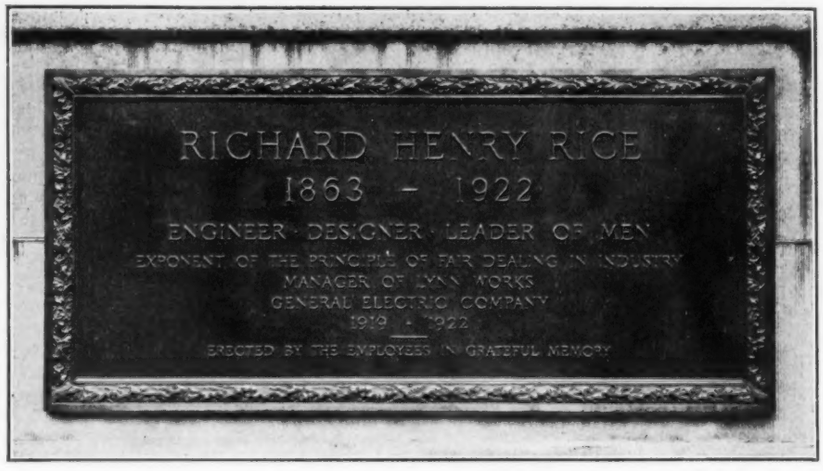
SOME OF THE PROJECTS IN VIEW

The works to which the capital thus obtained by the Italian companies will be devoted are said to include the construction of new plants for the exploitation of the Tanaro River and the high Po Valley in the Piedmontese region and the completion of the first unit of another big plant now under construction in Lombardy and of the Monviso plant, able to produce 40,000,000 kw.-hr. in summer and 32,000,000 kw.-hr. minimum in winter. The last-named plant started operation with the first unit late in August and supplies the paper mills in the territory. Another plant, the best in north Italy, is the Moncenisio station, which produces from 90,000,000 kw.-hr. in winter to a maximum of 120,000,000 kw.-hr. in summer, and arrangements have been made to turn over this plant for operation to the Società Alta Italia of Turin on Jan. 1, 1923. It delivers most of its energy to the important Fiat automobile industry of Turin and through a system of interconnection can supply eventually other zones in case of shortage or interruptions. Another plant, in the Aosta Valley, will be enlarged and will be able to double its capacity and supply energy as far as Milan and through interconnections also to the Genoese region. Still other works are now under way, and several plans are under examination by the government as a preliminary to the granting of franchises. These projects include the construction of seven new power houses in the Aosta Valley, which will be started as soon as franchises shall have been granted and sufficient capital obtained for their completion. The aggregate capacity of the seven plants is figured at 200,000 hp. as the minimum. The market for the energy thus produced is already provided, applications having been made for it by industries, mostly mechanical and textile, in the Piedmontese and adjoining regions.

It is interesting to note that under Italian law the franchises for derivation of water power are granted by the government for sixty years and automatically renewed. Those already granted prior to Oct. 2, 1919, were thus renewed automatically to expire Jan. 31, 1977.

Lynn Workers Honor Memory of R. H. Rice

In commemoration of the life and work of the late Richard H. Rice, manager of the Lynn (Mass.) works of the General Electric Company from 1919 to 1922, a bronze tablet was dedicated at the works on Sept. 19. John J. Kelley was master of ceremonies, and the speakers included Nelson J. Darling, Frank P. Cox and Stanley S. Ringer. The tablet was unveiled by Mrs Hershel McKnight of Schenectady, N. Y., a daughter of the late manager.


RICHARD HENRY RICE
1863 - 1922
ENGINEER · DESIGNER · LEADER OF MEN
EXPONENT OF THE PRINCIPLE OF FAIR DEALING IN INDUSTRY
MANAGER OF LYNN WORKS
GENERAL ELECTRIC COMPANY
1919 - 1922
ERECTED BY THE EMPLOYEES IN GRATEFUL MEMORY

TABLET TO MEMORY OF LATE MANAGER GENERAL ELECTRIC WORKS AT LYNN

Mr. Rice was a pioneer in developing the system of employee representation. The money for the tablet was raised in 5-cent subscriptions from the ten thousand employees of the factory.

Ford Men Said to Be Surveying Wisconsin Streams

Engineers in the employ of Henry Ford have been, according to a report from Wisconsin, engaged in a survey of the water-power possibilities of the Kickapoo and Wisconsin Rivers. Options on zinc-producing mines in Wisconsin are said to have been taken by the Ford interests, and it is thought that if sufficient water power can be developed zinc suitable for use in automobile tires will be manufactured electrically in industrial plants to be established.

Water Power in New York

Hydro-Electric Development and Utility Regulation Will Play Large Part in State Campaigning

THE platforms of the Republican and Democratic parties in New York State this fall both pay special attention to the questions of water-power development and the regulation of public service companies. The Republican party indorses the policy of Governor Miller on these questions. Of water power it says:

"The subject of developing the potential water powers of the state has been discussed for more than a quarter of a century, but no forward step was taken until 1921 to inaugurate a definite state policy. Such a policy has now been established for the development by license under state supervision and regulation, securing general distribution at a fair price to the consumer and with a preferential right in municipalities to purchase any power developed on terms prescribed by public authority. Already plans are well advanced for developing the possibilities of the Black River and upper Hudson watersheds, which will produce more than 350,000 continuous horsepower, representing an annual saving of more than 3,500,000 tons of coal.

"The surplus waters of the canal afford a development of at least 40,000 continuous horsepower, representing an annual saving of 400,000 tons of coal. That power only remains to be harnessed, but it has been allowed to run to waste for many years while the question as to who should harness it has been debated. The debate has now been ended, the plan of development decided on and the work of development actually started. Inasmuch as the state has constructed and now maintains the canal for navigation purposes, the development of water power is to be made by the state itself in order that it may retain complete control of the entire project undertaken by it and safeguard the needs of navigation. We pledge the continuance of that policy."

DEMOCRATS FOR STATE OWNERSHIP

The Democratic party declares for the "development and distribution by the state of hydro-electric power for the benefit of all the people in order to bring about cheaper light and power." "Hydro-electric power," it says, "can and should be developed as a state-owned public utility to operate railroads, the state barge canal and industrial enterprises of every description at an immense saving to the consumer. We are opposed to the Republican policy of private exploitation of the water resources of the state and to the proposed Miller amendment to the constitution passed by the Republican Legislature of 1922, which would deliver the state resources to private monopolies."

The Republicans claim that under their control "more efficient regulation of the public utilities with exact justice to the public and those who serve the public" has been attained. The Democrats come out flatly for "home rule," declaring:

"We pledge the Democratic party to the enactment of statutes that will give the fullest measure of home rule to local communities in dealing with and regulating public utility corporations. Divided responsibility must cease and adequate power to discharge their duty be given to local officials, who are best fitted to solve the public utility problems of their community. We favor the delegation by the state to municipalities of power to control public utilities operating wholly within their limits. The state should retain the power to control only public service corporations whose activities are statewide."

Federal legislation which will prohibit the appointment of federal judges as receivers for local public utility corporations, or the issuance by them of injunctions restraining local authorities from administering and enforcing state laws or the provisions of franchises and contracts to which a community is a part, is also favored in the Democratic platform.

Great Lakes Men Discuss Appliance Selling

John F. Gilchrist Submits Cost Data and Recommends Help to Independent Dealer—Finance and Interconnection Also Among Topics Discussed at French Lick Springs

WITH nearly 500 delegates registered, the convention of the Great Lakes Division of the National Electric Light Association at French Lick Springs, Ind., set a mark last week for the other geographic divisions to shoot at in their future activities and indicated the way in which the division organization can and is beginning to function in central-station activities. Not only was the attendance large but the program attracted unusual interest and comment.

The discussion by John F. Gilchrist, vice-president Commonwealth Edison Company, of policies in merchandising electric appliances attracted intense interest because of the merchandising costs shown in an analysis of the experience of that company, which was illustrated by a tabulation of washing-machine transactions in June and July, 1922. Mr. Gilchrist used the washing machine as more or less typical of the entire merchandising situation and pointed out the urgent need for a full knowledge of the costs of merchandising, since the central-station companies, with all their influence and prestige, will do the industry an incalculable injury if they sell merchandise on a basis that does not result in reasonable profits.

Mr. Gilchrist made a convincing plea that the central station back the independent dealers and lend all the aid possible in establishing them on a profitable business basis.

CUSTOMER OWNERSHIP OF SECURITIES

President Harry Reid referred to the increase in the volume of securities owned by customers in the four states making up the Great Lakes Division and to the better public relations that had resulted. He maintained that more capital is invested and more energy sold in the Great Lakes Division than in any other division of the national association.

In his address at the banquet President Frank W. Smith of the National Electric Light Association congratulated the convention on the development of the Great Lakes Division, saying that recognition of the duty of mutual help had been attained. The division, he said, occupies a dominating position in economical production of electrical energy from steam, some of its plants being among the largest and most efficient in the world.

E. Hill Leith of Halsey, Stuart & Company divided industry into stages of promotion, reorganization, expansion and the period in which the problems of financing future growth are uppermost. The last ten years, Mr. Leith said, have been the period of expansion. The financing problem is the big one of the future.

INDUCTIVE CO-ORDINATION

The status of the inductive-co-ordination work was discussed by R. F. Pack for the National Electric Light Association and H. P. Charlesworth for the American Telephone & Telegraph Company. Continued co-operation between the two utilities was urged.

John H. Mitchell, chairman of the educational committee, reported a proposal to divide the four states of the division into sections, to be assigned to individual members of the committee.

E. W. Lloyd, chairman of the Joint Committee for Business Development, outlined its work and urged co-operation through electrical leagues or other local bodies.

Chairman R. F. Schuchardt of the power survey committee defined its object as the formation of a comprehensive and economical scheme for the interconnection of the various systems in the four states, saying, however, that their geographic position is such that systems in adjoining states will be concerned.

Rural service was discussed by several delegates, led by Eugene Holcomb, chairman of the division committee. Chairman Neff of the national committee participated. Co-operation with the farmers' associations was the burden of the discussion.

INDUSTRIAL POWER RATES

Morse DellPlain of Hammond, in discussing "Power," expressed the view that the industrial power field is a competitive one and held that the central

station should be allowed to increase its industrial rates as it thought right, leaving the competition from other forms of power to regulate the price just as competition regulates the price of any commodity.

S. M. Kennedy, vice-president Southern California Edison Company, in a paper on "Greater Service," read by E. W. Lloyd in the absence of the author, said that in one California company forty persons are devoting their time to discussing service with the consumers.

Boston Edison Will Begin Its Weymouth Plant

The Edison Electric Illuminating Company of Boston has decided to start building its new Weymouth station immediately, and Stone & Webster are now in collaboration with I. E. Moultrop, assistant superintendent of construction, to that end. The initial installation will probably be 60,000 kw.

Oklahoma Light and Power Men to Meet at Tulsa

Modern power-plant construction and operation and the manner of improving electric service will be among the topics discussed at a conference of the electric light and power division of the Oklahoma Utilities Association to be held at the Hotel Tulsa, Tulsa, on Oct. 17. This will be a conference of the light and power men residing in the First District of the association, comprising several counties in northeastern Oklahoma. Other district conferences will follow.

S. J. Smallwood, manager of the Hominy Light & Power Company, chairman of the First District, will preside, and J. F. Owens and O. D. Hall of Oklahoma City, F. W. Insull and J. H. Buell of Tulsa, P. B. Stockwell of the Corporation Commission, C. H. Tingley of Sand Springs and C. L. Proctor of Joplin, Mo., will speak.

Edison Companies' Program for Next Week

On Tuesday to Friday, inclusive, next week the Association of Edison Illuminating Companies will hold its thirty-seventh annual meeting at the Greenbrier, West Sulphur Springs, West Va., the attendance, as usual, being confined to representatives of member companies and invited guests. The following technical program, subject to revision, has been adopted:

TUESDAY, OCT. 10

Afternoon — Committee appointments; presidential address; report of executive committee; report of treasurer, W. H. Atkins; report of Committee on Standards, W. C. L. Eglin, chairman.

WEDNESDAY, OCT. 11

Morning—Report of Committee on Steam Turbines and Generators, C. F. Hirshfeld; "Alternating-Current Underground Distribution," M. T. Crawford; "Recent Developments in Direct-Current Distribution," C. W. Wilder and C. H. Shaw; "Future Development of Distribution Systems," W. C. L. Eglin.

Evening—"Threatened State Control of Water Powers" (address), P. S. Arkwright; symposium on European impressions by member-company representatives who have recently visited Europe.

THURSDAY, OCT. 12

Morning—Report of Committee on Electricity Distribution and Use, L. L. Elden; report of Committee on Metering and Service Methods, F. V. Magalhaes; "Household Electric Refrigeration," T. I. Jones.

Evening—Report of Committee on Merchandising Policy, J. F. Gilchrist; "The Wiring Situation and What to Do About It," R. S. Hale; "The Industrial Relations Department of the Commonwealth Edison Company," Homer E. Niesz; report of Committee on Street Lighting, J. W. Cowles.

FRIDAY, OCT. 13

Morning—Report of Committee on Residence Survey, H. B. Gear; report of Lamp Committee, John W. Lieb.

Election of officers; report of Committee on Resolutions; banquet.

September Financing at Lower Rates

THE lull in the bond market which was so evident in electric light and power public utility financing during the month of August was followed by a period of brisk activity during September, when stocks and bonds of this type amounting to $54,461,100 were offered investors. This figure represents an increase of more than $13,000,000 over September, 1921. Attention is called to the low average rate which the issues yielded, 5.97 as compared with 6.60 for August and 6.61 for July. Two one-hundred-year issues appeared in the month's flotations, and the largest single offering was the twenty-one-million-dollar issue of the Kansas City Power & Light Company. An unusually interesting feature of September financing was the redemption by the American Light & Traction Company of $3,000,000 of the $6,000,000 in five-year 6 per cent gold notes issued only two years ago.

SECURITY ISSUES OF ELECTRIC SERVICE COMPANIES IN SEPTEMBER

Name of Company	Amount of Issue	Period	Class of Security	Purpose of Issue	Rate of Interest	Offered at	Per Cent Yield
Iowa Falls Elec. Co.	$600,000	Fifteen-year	First mortgage gold bonds	To retire maturing obligations and for other purposes	6	97½	6.25
Vermont Hydro-Electric Corp.	100,000	One-year	Gold notes		7	100¾	6.20
Quincy Electric Light & Power Co.	250,000	Twenty-five-year	First mortgage bonds	To call ten-year, 7 per cent notes	5	Placed privately	
Northwestern Electric Co. (Ore.)	1,000,000		Cumulative first preferred stock		7	Par	7
Shawinigan Water & Power Co. (Que.)	1,111,500	Twenty-nine-year.	First refunding mortgage sinking-fund gold bonds, series B	To pay floating debt and provide for construction	6	104½	5.65
Consolidated Gas, Electric Light & Power Co. of Baltimore	5,000,000	Thirty-year	First refunding mortage sinking-fund gold bonds, series E	To refund bonds to be called for redemption	5½	99½	5.50
Kansas City Power & Light Co.	21,000,000	Thirty-year	First mortgage gold bonds, series A	To retire outstanding funded debt and for new property	5	93	5.47
Kansas City Power & Light Co.	2,400,000		First preferred stock, series A (cumulative dividend)	To retire outstanding funded debt and for new property	7	96	7.30
Nebraska Power Co.	3,500,000	One-hundred-year	Gold debenture bonds, series A	For retirement of bonds, notes and floating debt	6	90½	6.60
Philadelphia Suburban Gas & Electric Co.	400,000		Cumulative preferred stock		7	97	7.2
Portland Railway, Light & Power Co.	2,500,000	Twenty-five-year.	First lien and refunding mortgage, series B	To reimburse expenditures for property and acquisition of bonds	6	96	6.30
Kansas Gas & Electric Co.	3,000,000	One-hundred-year	Gold debenture bonds, series A	To retire bonds and for other purposes	6	90½	6.60
Columbus, Delaware & Marion Electric Co.	1,374,000	Twenty-year	First and refunding mortage gold bonds of 1917		5	96½	6.35
Kansas Electric Power Co.	1,000,000		Cumulative preferred stock	To refund bonds for acquisition of property and for additions	7	92½	7.57
Ohio Public Service Co.	3,625,600		Cumulative first preferred stock, series A	To provide funds for unification of properties by new construction	7	94	7.40
Pennsylvania Power & Light Co.	7,000,000	Thirty-year	First and refunding mortgage bonds, series B	To reimburse in part expenditures for construction and other purposes	5	92½	5.50
Western New York Utilities Co., Inc.	600,000	Twenty-four-year.	First mortgage gold bonds of 1916		5	90½	5.75
Total	$54,461,100						

Commission Grants Licenses

Projects for Development on Ouachita and Clarion Rivers Approved—New Applications

FINAL action upon the grant of licenses has been taken by the Federal Power Commission in four cases.

The Caddo River Power & Irrigation Company of Little Rock, Ark., has received a license for fifty years to develop a power project on the Ouachita River, partly on land of the United States within the Arkansas National Forest in Garland and Montgomery Counties, Ark.

The Clarion River Power Company of Foxburg, Pa., has received a license for fifty years for a power project on the Clarion River in the county of that name.

A license for twenty-five years has been granted the Royal Development Company of Butte, Mont., for a small power project on Dry, Chipmunk and a third unnamed creek, all tributary to Phelps Creek, on lands of the United States partly within Wenatchee Forest, Wash.

To the County of Mineral, Nev., a license for a transmission line across lands of the United States in that county has been granted for a period of fifty years.

PRELIMINARY PERMITS GRANTED

Four applications for preliminary permits have been granted by the commission.

The California-Oregon Power Company of San Francisco has received a permit for two years looking toward a power project on the Klamath River in Klamath County, Ore., involving one or more dams. Investigations are being made of the so-called Klamath-Shasta irrigation district, and the permit is granted with the understanding that the formation of such a district and the diversion of water from the Klamath River might make a license for the power project impracticable or undesirable.

The application of the Saw Tooth Power Company of Wilmington, Del., for a preliminary permit for a power project on Pass, Smith and other creeks, twenty-six in all, in Kougarck recording precinct, Alaska, involving conduits, reservoir, power house and auxiliary works, has been granted for thirty months.

The application for a preliminary permit of the Willow Creek Mines, a corporation of Seattle, Wash., for a power project on Craigie Creek, in Knik recording precinct, Alaska, has been granted for thirty months. This project involves construction of a diversion dam, conduit, power house and auxiliary works.

James H. Mays of Salt Lake City, Utah, and Henry L. Gandy of Rapid City, S. D., have obtained a preliminary permit for two years for a power project on Huntington Creek, Emery County, Utah. This contemplated project involves the construction of a three-mile conduit, a power house and other works.

The Alabama Power Company has applied for a preliminary permit covering its project for the development of 60,000 hp. of primary power on the Tallapoosa River in Elmore, Randolph, Chambers and Tallapoosa Counties. The construction of four dams is proposed—one 110 ft. high at Cherokee Bluffs, 10 miles above Tallahassee; one 85 ft. high just below the mouth of Higby Creek, 5 miles from Alexander City; one 60 ft. high at a point on the river 10 miles north of Dadeville, and one 150 ft. high just above the mouth of Crooked Creek, a few miles below the junction of the Tallapoosa and the Little Tallapoosa. The application follows the report of the Chief of Engineers to the effect that the project comes under the jurisdiction of the Federal Power Commission. It is understood that the company plans the full development of this project within a period of ten years, and that it is the intention of the company to go through with it regardless of any rights that it may acquire at Muscle Shoals.

The commission has reaffirmed after investigation its previous decision that the proposed power development of the Grafton-Caledonia Power Company of New Hampshire on the Connecticut River in New Hampshire and Vermont does not affect interstate commerce inasmuch as the Connecticut River at the point concerned is not a navigable stream.

The declaration of intention by Morrison & McCall of St. Louis, Mo., for dams across and in Eleven Point and Spring Rivers in Randolph and Lawrence Counties, Ark., was declared by the commission to affect interstate interests and therefore to be within its jurisdiction.

New England Men Discuss Power Problems

At the New England regional meeting of the American Society of Mechanical Engineers, held in Springfield, Mass., Sept. 25-27, problems of power and plant efficiency of interest to electrical men were discussed. The opening session Monday resolved itself into a forum on power, with C. C. Chesney, manager of the General Electric Company's Pittsfield plant, in the chair. A paper on "Multiple Source of Power for Reliable Industrial Plant Operation" was read by R. A. Packard, superintendent for power and shop for the Ludlow (Mass.) Manufacturing Associates. He explained how with its two hydro-electric stations, a steam-power plant and three substations for transforming current, one of which is fed from the Turners Falls company's transmission wires, the company is enabled to avoid more than two minutes' interruption of power in any except the most unusual emergencies.

He was followed by R. J. S. Pigott, works manager of the Crosby Steam Gauge & Valve Company, Boston, who gave a talk on "Economics in the Use of Fuel for Small Industrial Plants." As only comparatively few plants can afford to install such a system as that which provides power at Ludlow, he said, the problem of the rest is to obtain all possible economy from existing sources. The introduction of mechanical stokers is an increasing necessity, and along with this should go the installation of flowmeters, taking accurate account of every element of power service. Many industries that now maintain power plants of their own would be better off, he thought, to buy their power from some large central station.

In the discussion following these papers the relative advantages of the single and multiple power systems were considered, and R. E. Woolley of the General Electric Company's Schenectady plant told of the progress being made in introducing flowmeters. W. N. Polakov, a consulting engineer on power for the New York municipal government, said the human element must be kept in mind at all times as essential to the success of every so-called automatic device that might be introduced. No such contrivance can be really automatic, he said; there must be a brain to direct it, and the trouble with a great many efficiency devices was that, once installed, they were left to gather dust and cobwebs.

Power Exposition Planned for New York in December

Following the annual meetings of the American Society of Mechanical Engineers and the American Society of Refrigerating Engineers, a national exposition of power and mechanical engineering is to be held in the Grand Central Palace, New York City, to continue from Dec. 7 to Dec. 13. Irving E. Moultrop of the Edison Electric Illuminating Company of Boston heads the advisory committee, and among his colleagues are Dexter S. Kimball, president A. S. M. E.; Milan R. Bump, N. A. Carle, E. B. Katte, Calvin W. Rice and Fred R. Low.

The exposition will stress the engineering phases of the problems involved in the economical uses of fuel and the more effectual generation and utilization of power.

Telephone Pioneers in Ohio Hear California and Cuba

The spectacular feature of last week's convention of the Telephone Pioneers of America, held in Cleveland, was a public demonstration of the marvels of modern telephony, attended by thirteen thousand persons, who heard distinctly a conversation carried on between Gen. J. J. Carty, president of the Pioneers, present in Cleveland, and telephone officials in San Francisco, Havana and many less distant cities.

More than two thousand delegates from all parts of the country attended the convention. Leonard H. Kinnard, president of the Bell Telephone Company of Pennsylvania, was elected president of the association for the ensuing term.

Brief News Notes

Sweden's Consumption of Energy.—Recent figures reported by Trade Commissioner Sorensen to the Department of Commerce put the present yearly consumption of electrical energy by Sweden at 2,143,700,000 kw-hr., of which industrial establishments take 1,347,100,000 kw.-hr.

Australian Electrification Under Way.—The electrical plans for the State of Victoria, Australia, which involve the use of brown coal to develop 50,000 kw. at the mines, the energy to be transmitted over a 112-mile transmission line to Melbourne, are now well under way, and the new plant is expected to be in operation within two years. A large part of the apparatus has been delivered, and the five 12,500-kva. turbo-generators are in process of erection. The brown coal will be made into briquettes at the station site.

Appleton Celebration Postponed.—The ceremonies planned to celebrate the opening of the Appleton (Wis.) electric central-station plant forty years ago, soon after the inauguration of commercial service in New York City, were not held on Sept. 30, the date that had been announced. It has been thought best to postpone the event until a permanent bronze tablet of commemoration can be made, rather than to erect a temporary wooden one, as was first intended. The celebration will probably not take place till next year.

New York's Electric Truck Parade.—With more than 150 trucks entered, the electric truck parade scheduled for Tuesday, Oct. 10, in connection with the New York Electrical Show, promises to be one of the most successful events ever arranged by the local electric vehicle interests. The trucks will represent about sixty individual owners in thirty different lines of industrial activity. The parade will start at 10 a.m. from Fifth Avenue and Sixty-fifth Street and, escorted by a squad of motorcycle police, will proceed down Fifth Avenue to Washington Square.

Michigan Villages to Say Farewell to Municipal Plant.—Montcalm County (Mich.) villages are reported as hailing with satisfaction the expected passing of the municipal plant at Stanton, on which they have been dependent for such electric service as they have had, and its replacement by hydro-electric service. The Stanton steam plant has never paid expenses, has been subject to frequent breakdowns, and when the coal strike came ran out of fuel. Glenn Gardner, until recently head of the Prairie Creek Power & Light Company, Muir, Mich., has moved to Stanton with the intention of building a dam on the Flat River at Langston, one of the complaining towns, and establishing a central station which will be able to serve all the nearby communities.

Japan Has an Electrically Driven Naval Vessel.—The 20,000-ton fuel ship Kamoi of the Japanese Navy, said to be the first vessel of any navy other than that of the United States to be electrically propelled, has completed successfully its builders' trials off the Delaware Capes. The electric drive equipment of the Kamoi, designed and installed by the General Electric Company, includes the use of synchronous motors for the first time in any twin-screw vessel. Tests demonstrated that the Japanese ship is the most economically operated steam vessel of her size afloat, observers declared.

Long Island Railroad Planning Ahead.—The Long Island Railroad, which carries many thousands of persons employed in New York City to and from their suburban homes, is planning the ultimate electrification of its entire 40-mile commutation zone through the installation of additional power equipment in its Long Island City plant. The plans to replace steam with electricity will be carried out first probably on the Montauk division to Babylon. Eventually the company hopes to electrify the entire Oyster Bay branch and the Wading River branch to Huntington or Northport, thus providing through service from Manhattan and Brooklyn and eliminating the present necessity for changing trains at Jamaica, where electric service now ends.

Alabama Power Company Sends Emergency Power 600 Miles.—Coming to the rescue of cotton mills and other industries in the Carolinas whose energy supply was crippled both by low water in the rivers and the car shortage at the coal mines, the Alabama Power Company, according to W. E. Mitchell, assistant general manager, has been sending 35,000 hp. a day through its connecting lines to supply the deficiency. This power has been generated at the Gorgas and federal plants at Muscle Shoals and at the company's Birmingham plant and has been sent to Greenville and Spartanburg, S. C., thence as far east as Raleigh, N. C., and north to Greensboro and Henderson, N. C., some of it being transmitted 600 miles.

Cable 13,800 Ft. in Length Brings Electricity to Fisher's Island.—By the installation of a 7,000-volt submarine cable, 13,800 ft. long, between Groton Long Point, Conn., and Fisher's Island, N. Y., the inhabitants of the island are now afforded modern central-station service. Energy is brought to the Groton substation over the existing transmission line from the Montville plant of the Eastern Connecticut Power Company. A two-mile line from this substation was built down to the water's edge. The present load is about 125 kw. at 2,300 volts and is virtually all lighting load. Any future increase in load can be supplied by tripling the voltage. The cable, which is armored with No. 6 galvanized-steel wire, consists of three No. 2/0 standard conductors, weighing 8.6 lb. per foot with an over-all dimension of 2.8 in.

Associations and Societies

Canadian Engineers Discuss Hydro-Electricity.—At the annual meeting of the Engineering Institute of Canada, held last month at Winnipeg, Manitoba, the first day was given up to the presentation and discussion of papers describing the hydro-electric plants in the vicinity of Winnipeg. On the following day an inspection of these plants was made by the 200 members in attendance.

Small-Residence Wiremen Form Association in Vancouver.—A step forward in the organization of the small-residence wiremen has been taken in Vancouver, B. C., by the formation of the Electrical Contractors' Association of British Columbia under the auspices of the Electrical Service League. This organization is entirely independent of any existing electrical contractor association and is formed for the purpose of bettering conditions among the residence wiremen.

Section Meetings, A. I. and S. E. E.—The Pittsburgh Section of the Association of Iron and Steel Electrical Engineers, meeting on Oct. 14, will hear a paper by G. E. Stoltz, Westinghouse Electric & Manufacturing Company, on "Improved Rolling-Mill Practice Obtained by the Use of Direct-Current Motors for Main Roll Drive." The paper presented at the October meeting of the Cleveland District Section will be on "Electric Smelting of Iron Ores," by Alfred Stansfield, Birks professor of metallurgy at McGill University, Montreal.

Coming Meetings of Electrical and Other Technical Societies

A complete directory of electrical associations is published in the *Electrical World* in the first issue of each volume. See July 1 issue for latest list.

Society of Motion Picture Engineers—Rochester, N. Y., Oct. 9-12.

National Association of Electrical Contractors and Dealers—Cincinnati, Oct. 9-14. F. Johnson, 15 West 37th St., New York.

Association of Edison Illuminating Companies—White Sulphur Springs, W. Va., Oct. 10-13. Preston S. Millar, 80th St. and East End Ave., New York.

Society of Industrial Engineers—New York, Oct. 18-20.

Public Utilities Association of West Virginia—Charleston, W. Va., Oct. 20-21. A. Bliss McCrum, Charleston, W. Va.

Electric Power Club—Asheville, N. C., Oct. 30-Nov. 2. S. N. Clarkson, Kirby Bldg., Cleveland, Ohio.

Arkansas Utilities Association—Hot Springs, Ark., Nov. 7 and 9. R. P. Brown, Little Rock Ry. & Electric Co., Little Rock.

Electrical Credit Association (interstate convention)—Philadelphia, Nov. 10. J. W. Crum, 1328 Land Title Bldg., Philadelphia.

Ontario Association of Electrical Contractors and Dealers—Toronto, Nov. 13-14. J. A. McKay, 24 Adelaide St. W., Toronto.

National Association of Railway and Utilities Commissioners—Detroit, Nov. 14-17. J. B. Walker, New York Transit Commission, New York.

Electrical Credit Association, Central Division—St. Louis, Nov. 16-17. F. P. Vose, 1347 Marquette Bldg., Chicago.

Electrical Supply Jobbers' Association—Cleveland, Nov. 20-24. Franklin Overbagh, 411 S. Clinton St., Chicago.

American Society of Mechanical Engineers—New York, Dec. 7-13.

Commission Rulings

Invasion of Territory for Special Purpose Disapproved.—The Borough of Ashland, Pa., complained to the Pennsylvania Public Service Commission against the Schuylkill Electric Company and the Schuylkill Railways Company, asserting that electric light wires had been installed on the poles of the railway company by the lighting company to carry energy into the territory of the complainant. It appeared that this had been done with the object of serving gratuitously the general manager of the Schuylkill Electric Company, who resided in Ashland Borough. The commission ordered the service discontinued unless its consent and that of the borough authorities was first obtained.

Unprofitable Rural Rates.—The Wisconsin Railroad Commission has ordered the Rio Electric Company to increase its rural charge for a 1½-kw. transformer from $1 to $1.50 a month, finding the old rate entirely inadequate to carry the maintenance and retiring expenses due to the lines being longer and installations more expensive than those used by average village consumers. It found that the company's local customers were carrying slightly more than the cost of service to them, while the rural customers were served at a material loss despite the fact that they had contributed to the construction of the lines. The commission held that rural rates must therefore be increased to permit a reduction in the village rates paid.

Basing Rates on Advance Construction.—In granting an increase in electric rates to the Consolidated Gas Company of Long Branch, N. J., which furnishes electrical energy to a number of New Jersey communities, the New Jersey Board of Public Utility Commissioners criticised the company for including in its rate base for 1922 virtually all its new investment, including a generating set which should, the commission held, be "taken into the rate base on installments running over perhaps three years. In other words, a schedule based on 1922 anticipated operations and with the value stated by the company for 1922 would in the long run be unfair to the customers as representing too high an average value for that year."

Utilities Must Bear Average Costs of Extension.—Consumers of gas and electricity in Birmingham, Montgomery, Mobile and other points served by the Alabama Power Company will not be required in the future to bear the total cost of extensions of mains and connections under a decision recently announced by the Alabama Public Service Commission. Instead, the companies serving the towns will be required to bear the average cost of extending the system in order to accommodate new customers and will be permitted to assess any additional cost against the consumer, allowing him credit on his bills at regular intervals until he has been repaid in full for the amount advanced. Exceptions were made whereby an electric company cannot be forced to pay for extensions in a development for speculative purposes and whereby wholesale power consumers may be required to meet the cost of extensions subject to repayment at fixed intervals. The decision of the commission is directed against the Birmingham Railway, Light & Power Company, the Alabama Power Company, the Montgomery Light & Water Power Company and the Mobile Electric Company.

Damages for Interruptions of Service.—The Pennsylvania Public Service Commission dismissed a complaint asking for damages for interruptions of electric service brought against the Philadelphia Suburban Gas & Electric Company by the McClintic-Marshall Construction Company. The claim put forth was because of wages paid during periods of service interruption. The company showed that the failure was due to the coal strike and a shortage in the allotment of cars made to it for transporting fuel, to the poor quality of coal purchased in the open market, and to high water in the river bringing down débris and choking the intake. The commission held that these occurrences constituted a cause reasonably beyond the company's control and were, by the terms of the service contract, a sufficient reason for the interruption.

Principles Governing a Partition of Territory.—In dividing between the Vallejo Electric Light & Power Company and the Great Western Power Company certain territory in Solano County where both companies claimed rights (see *Electrical World* for Aug. 19, page 395) the California Railroad Commission said regarding the portion assigned to the Vallejo company: "It must be borne in mind, however, that the present lines of the Great Western company are closer to parts of this territory than are the present lines of the Vallejo company. The requirement that this territory be served solely by the Vallejo company might work a hardship either on that company, by requiring it to make extensions which might be more economically made by the Great Western company, or else upon applicants for service by preventing them from securing service from the adjacent lines of the Great Western company. The order will therefore provide that extensions in this intermediate territory be made by the Vallejo company, but in the event that the Vallejo company refuses to serve any applicant for service, then the service may be supplied by the Great Western company. Should such a contingency arise it will, of course, be expected that the Great Western company will serve any other future consumer adjacent to the lines so constructed and that the Vallejo company will refrain from paralleling any such lines of the Great Western company."

Recent Court Decisions

Supreme Court May Make Its Own Finding of Facts in Review of Case Affecting Commission.—In a steam-railroad case (State ex rel. St. Louis-San Francisco Railway vs. Public Service Commission), a suit affecting a commission order, the Supreme Court of Missouri declared its right to make its own finding of facts, asserting that on review of a Circuit Court judgment the proceeding must be treated as a suit in equity. (242 S. W. 938.)*

Provision of Pennsylvania Law Giving Commission Control Over Municipal Contracts with Utilities Not Retroactive.—The Supreme Court of Pennsylvania has declared, in Borough of Collingdale vs. Philadelphia Rapid Transit Company, that a provision of the Public Service Commission law making contracts between municipalities and utilities subject to commission approval is not retroactive and that lack of such approval does not take away the jurisdiction of a court to enforce the conditions of a franchise granted in pursuance of a contract made before passage of the commission law. (117 At. 909.)

Grantee of Flowage Rights Pertaining to Riparian Land Must Not Flow Lands Not Conveyed.—In Eley vs. Twin State Gas & Electric Company damages were sought because of the flooding of plaintiff's cellar owing to a dam maintained by defendant company. Flowage rights under a deed of conveyance of part of certain riparian lands were claimed, but the Supreme Court of New Hampshire decided that although, by the provisions of the instrument, the grantee had the right by maintaining a dam to raise the water opposite the grantors' land to an extent which would cause only nominal damages, it had no right to flow the part of land not conveyed. (117 At. 817.)

Electric Company Responsible for Injury from Its Wires to One Using Footpath as Licensee.—The Appellate Court of Indiana has confirmed damages awarded in Sanders vs. Terre Haute, Indianapolis & Eastern Traction Company for the death of a boy who while walking on the railway's right-of-way took hold of a wire dangling from its overhead transmission wires and in contact with high-voltage lines. The court found that the public had been using the right-of-way as a footpath for many years, that the boy was therefore a licensee for whose safety from its wires the company was responsible, and that the complaint, which did not set out the exact location of the wire alleged to be dangling and which described in general terms the alleged neglected and unsafe condition of the company's lines, was sufficiently specific. (136 N. E. 54.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Men of the Industry

Changes in Personnel
Accomplishments, Responsibilities, Honors, Appointments and Activities of Men
Engaged in all Branches of the Electrical Industry

Guy L. Bayley Has Joined Staff of Sanderson & Porter

Guy L. Bayley, formerly chief of the mechanical and electrical departments of the Panama-Pacific International Exposition and for many years engaged in hydro-electric work on the Pacific Coast, has joined the staff of Sanderson & Porter, consulting engineers of New York, Chicago and San Francisco, and will be particularly concerned with

G. L. BAYLEY

water power. For a number of years Mr. Bayley, who was born and educated in California, was employed by electric public utilities on the Pacific Coast, notably the Pacific Gas & Electric Company, the Sierra & San Francisco Power Company and the Universal Electric & Gas Company, as an operator of hydro-electric systems, and in 1916 he erected the hydro-electric plant in Yosemite for the Department of the Interior. More recently he became interested in foreign exportations, and he has toured Japan, Korea, China, Siam, the Straits Settlements, Java and Sumatra as assistant to the president of the Federal Export Corporation of New York City. He had already had experience in this work, having represented the American Trading Company from 1900 to 1904 in Japan.

E. G. Quarnstrom, for the last five or six years superintendent of the municipal electric light plant, Madison, S. D., has resigned that position and taken one with the Union Public Service Company, Canby, Minn. He was a member of the executive committee of the North Central Electric Association last year and also chairman of the membership committee for South Dakota.

E. H. Fischer has been assigned to supervise the manufacture of the high-tension line insulators of the Illinois Electric Porcelain Company of Macomb, Ill. Mr. Fisher has been engaged in this work with some of the largest manufacturers for more than ten years.

Charles A. Coffin, one of the founders and until recently chairman of the board of the General Electric Company, celebrated the fiftieth anniversary of his wedding in characteristic fashion last week. With Mrs. Coffin he slipped away quietly to the home of his daughter, in Connecticut, and there amid his immediate family passed the day in domestic quiet. Despite Mr. Coffin's modest avoidance of any public commemoration of the happy event, felicitations from his friends and associates were showered upon him.

Hibben Succeeds Law as General Secretary of the I. E. S.

Samuel G. Hibben was chosen last spring to fill the role of general secretary of the Illuminating Engineering Society and took office at the beginning of this month. Mr. Hibben is manager of the illumination bureau of the Westinghouse Lamp Company, New York City, and has taken a prominent part in I. E. S. activities.

Clarence L. Law, the retiring general secretary of the society, was the guest of honor at a dinner on Wednesday evening, Sept. 27, at the New Ocean House, Swampscott, Mass., where the society held its sixteenth annual convention.

Professor Ryan's Candidacy Well Received

Reports indicate that the candidacy of Prof. Harris J. Ryan, head of the department of electrical engineering at Leland Stanford, Jr., University, for the presidency of the American Institute of Electrical Engineers has been received with enthusiasm throughout the country. Professor Ryan's candidacy was brought about by an enthusiastic indorsement from both Eastern and Western engineers at the recent Vancouver convention of the Institute, a recognition prompted by his brilliant attainments in the engineering field. His position in electrical engineering has been gained through his many contributions to the art and through his leadership in educational and scientific societies.

Professor Ryan for many years occupied the chair of electrical engineering at Cornell University, Ithaca, N. Y. In his early days important patents were awarded to him, notably in conjunction with M. E. Thompson for the Thompson-Ryan equipment and for repulsion and interpole motors. Since he has been at Stanford University Professor Ryan has acted in a consulting capacity for many of the large hydro-electric systems of the Pacific Coast. He has also done important research work in connection with high-tension insulation.

Arthur Simon New President of Engineers' Society of Milwaukee

Arthur Simon, the new president of the Engineers' Society of Milwaukee, has been connected with the electrical industry since 1903. After being graduated from the Technical University of Darmstadt, Germany, in 1902, with the

ARTHUR SIMON

degree of electrical engineer, he devoted some time as post-graduate to the study of power-transmission problems. In 1903 Mr. Simon came to America and joined the Cutler-Hammer Manufacturing Company as draftsman, and two years later he was placed in charge of design and development of alternating-current apparatus, a position he held until 1920. Since then Mr. Simon has been engaged in general development and patent work for the company, covering the application of electric power to industrial and domestic purposes. He is a fellow of the A. I. E. E., a member of the A. S. M. E. and an associate of the Radio Institute. He was section chairman of the A. I. E. E. and his interest both in the Engineers' Society and in the civic problems of the city has been very active.

Henry L. Doherty President of Denver Gas & Electric

Henry L. Doherty has again taken over the presidency of the Denver Gas & Electric Light Company, filling the vacancy resulting from the recent death of Frank W. Frueauff. Mr. Doherty's headquarters will remain in New York.

Fred J. Singer has resigned as instructor of electrical engineering at the University of Wisconsin and is now in the department of development and research of the American Telephone & Telegraph Company, New York.

B. F. Jakobsen, who has held the position of chief designing engineer for the San Joaquin Light & Power Corporation for the past three years, has severed his connection with that company and opened offices in Fresno, Cal., as a consulting hydraulic and electrical engineer.

C. S. Gilbert, Sr., was elected treasurer of the Wisconsin Valley Electric Company at a meeting of the directors held recently at Wausau. Mr. Gilbert succeeds the late M. C. Ewing. Harold L. Geisse, who was acting manager in the past year during Mr. Ewing's illness, was elected secretary and general manager in Mr. Ewing's place.

D. C. Hess is now allied with the municipal electric light and power plant of Richmond, Ind., succeeding J. P. Dillon.

J. H. Crossley, electrical engineer of Manchester, England, recently spent considerable time in California visiting noteworthy hydro-electric developments.

Leland D. Wood, formerly electrical engineer with Edward C. Brown & Company, engineers, Boston, is now connected with the light and power department of Hudson, Mass., as manager.

Edwin A. Barrows, president of the Narragansett Electric Lighting Company, Providence, R. I., was recently elected president of the New England Division of the National Electric Light Association for the coming year.

Frank H. Woodward, formerly district manager of the Oakland division of the Great Western Power Company, has been appointed general sales manager in San Francisco, to succeed J. B. Black, promoted to the position of general manager.

George L. Smith of Fort Wayne, Ind., has been selected as superintendent of the new municipal electric light and power plant at Troy, Ohio. Mr. Smith became interested in the electrical profession in early boyhood and for several years was in the employ of the General Electric Company in the construction of electric plants. He has constructed as well as operated a number of municipal plants in Michigan.

N. J. Mittenthal has severed his connection with the International General Electric Company, Schenectady, N. Y., to become sales engineer with the Pacific States Electric Company, San Francisco.

J. J. Raftery has been appointed manager of the New York branch of the Manhattan Electrical Supply Company, Inc., the executive offices of which are now at 125 Church Street, New York City. Mr. Raftery was formerly with the Western Electric Company and recently on the staff of the Curtis Publishing Company.

W. S. Rugg Is Westinghouse General Sales Manager

W. S. Rugg, assistant to the vice-president, has been appointed general manager of sales of the Westinghouse Electric & Manufacturing Company. The position of general sales manager is a new one in this company, and Mr. Rugg's appointment to the post is a recognition of his broad experience in almost every line of the electrical industry and his capabilities in sales work, in which he has been engaged for many years. He may be said to combine the exact and analytical training of an engineer with the broad economic experience of a commercial executive.

Mr. Rugg was born in Broadhead, Wis., and was graduated from Cornell

W. S. RUGG

University. He became identified with the Westinghouse Electric & Manufacturing Company in 1892 and three years later was transferred from Pittsburgh to the Chicago office as district office engineer. While engaged in this position Mr. Rugg attracted the attention of the manager of that office, who decided that Mr. Rugg would make an excellent salesman. Mr. Rugg adapted himself to his new work with marked success, and in 1901 he was transferred to the New York office as special sales engineer. In 1909 he was made manager of that office, and in 1917 he was transferred to the East Pittsburgh works and made manager of the railway department. Soon afterward he became manager of the marine department also.

It was during Mr. Rugg's administration of the railway department, started when, because of the war, the industry was at its lowest ebb, that the most constructive work ever accomplished in that department was done. His success here resulted in his promotion in 1920 to be assistant to Vice-President Shute, in charge of sales. His duties in this position gave him special jurisdiction over negotiations and district office personnel and especially fitted him for the general sales managership.

Frank L. Blanchard, publicity director for the Cities Service Company of New York, recently inspected all of the Colorado holdings of the Doherty interests, including developments of the Denver Gas & Electric Light Company.

H. E. Dalzell has resigned as chief mechanical and electrical engineer of the Southern Railway of Peru after fifteen years' service in the tropics. Mr. Dalzell is taking eight months' holiday and expects to take up an appointment on the east coast of South America in the spring.

O. E. Hubbard, vice-president and general manager of the Clarksville (Tex.) Light Company, has been elected president of the Clarksville Chamber of Commerce, succeeding B. F. Marable, who has retired after serving two years at the head of the organization.

H. Pendergraph, who has been selected to succeed W. P. Guinan as new-business manager of the Montgomery (Ala.) Light & Water Power Company, goes to Montgomery from Athens, Ga., where he has been for the last three years business manager and representative of H. L. Doherty & Company. Prior to that he was manager of the Durham (N. C.) Utilities Company.

Markham Cheever, chief engineer and general superintendent of the Utah Light & Power Company, has been named chairman of the water-power development committee of the Salt Lake City Commercial Club and Chamber of Commerce. Other members of the committee are R. R. Lyman, E. H. Eardley, Lafayette Hanchett, H. B. Waters and A. M. Jackson.

Hugh M. Atkinson, chairman of the board of directors of the Georgia Railway & Power Company of Atlanta, has returned to this country after a three months' trip through various parts of Europe, during which he visited France, Switzerland, Italy and Austria. He was accompanied on the trip by Mrs. Atkinson, and its primary purpose was to visit the grave near Paris of their son, Capt. Harry Atkinson, Jr., who was killed in action during the latter part of the war. Mr. Atkinson also devoted considerable time to a study of economic and financial conditions in the countries visited.

W. L. Johnson, formerly with the Southern California Edison Company and the East Pittsburgh works of the Westinghouse Electric & Manufacturing Company, is now connected with the Los Angeles office of the Westinghouse company as automatic control specialist.

James D. Blackwell, Seattle, president of the Northwest Society of Engineers, has been appointed city engineer of Seattle, to replace A. H. Dimock, who had been in office since 1911. Mr. Blackwell went to Seattle in 1899 for Stone & Webster interests and aided in laying out a part of the city railway system. Since 1905 he has been associated with H. D. Hanford in general engineering practice.

Manufacturing and Markets

Devoted to the Discussion of Business and Economic Problems of the Producer and Distributor, with Market Reports, Trade Activities, Foreign and Construction News

A Review of the Jobber's Rôle—Part II

The Many Important Functions Which Are Filled by Him Serve Materially to Lessen the Burdens Imposed on Both the Manufacturer and the Dealer

THE following comments on the service which is rendered by the stocks of the electrical supply jobbers concentrated at centers of population throughout the country have been contributed from various sources and have been gathered together under appropriate general heads, but without any attempt to knit them into a narrative. They are presented rather as the opinions of many men on the practical usefulness of this service element in the machinery of distribution.

Credit Service

1. By operating in a more or less restricted territory the jobber is in position to know accurately the financial conditions that exist. That means not only the condition of each individual customer but the general financial situation throughout the territory. With this knowledge he is equipped to extend credit with the expectation of making collections in accordance with established terms and of incurring no more than reasonable losses through the accounts. The result is of real economic value, as it means a lower cost of distribution.

2. The jobber through close contact can develop the credit of the individual customer. It is within his power, through constant observation, to guide his customer along the right business channels, with the result that many a "moral risk" is gradually being placed upon a firm financial foundation.

3. Through the jobbers' operations, credit losses for all branches of the industry are materially reduced. This result is obtained through the jobber's closer contact with and knowledge of financial affairs in the trade within his more localized fields.

4. The jobber with accurate firsthand information is able to take on and develop into good customers for the manufacturer accounts which at a distance would not appear worthy of credit. For the same reason, the jobber can temporarily finance contractors beyond their actual worth.

5. The manufacturer is enabled to reduce his losses through poor credit work to a minimum because the jobber pays the manufacturer promptly.

6. The jobber is able to place the manufacturer's goods with small concerns because the jobber's credit man is in close touch with the situation and knows just how much credit to allow. The manufacturer at a distance would be greatly handicapped.

7. Were it not for the jobber, the retailer would find it practically impossible to finance his business. With the jobber providing proper service, the retailer, instead of having a multitude of bills payable, has but few bills-payable accounts, as would be the case were the product to go through from the manufacturer to the retailer. This serves two purposes, (1) the reduction of overhead expense, and (2) a better credit rating for the retailer, because where there are a large number of accounts with various concerns claims are bound to occur, and with such claims comes a disgruntled feeling on the part of the producer which might be reflected in the credit extended to the retailer.

8. Because of closer relationship with customers, jobbers extend more liberal lines of credit than could distant manufacturers, thus greatly aiding the development of many enterprises. This close relationship permits the jobber to operate with much smaller credit losses than would be possible if purchases were made from many manufacturers.

9. The existence of an electrical jobber permits his customer to concentrate his buying power and thus capitalize his credit.

10. With representatives in the field in personal and almost daily contact with their trade, the jobber is placed in a position where the confidence of the dealer is secured, and the dealer is educated along the lines of proper accounting and is impressed with the necessity of making prompt collections.

11. Oftentimes the jobber actually assists in making prompt collections for the dealer. This results in the retailer's obtaining a better and stronger financial position, something that could not be accomplished by the manufacturer because of the extremely large amount of work and detail involved.

12. Many financial losses to manufacturers and many financial failures are prevented each year by reason of the closer personal contact between jobber and dealer than would be possible between dealer and manufacturer.

13. One great service rendered by the jobber's able credit man is the guiding of a growing contractor-dealer business. He helps the dealer by suggesting better bookkeeping methods, time payment plans and proper collection practices. Often he is in a position, by proper consideration, to save a business from the financial disaster which in many cases will occur if a dealer's accounts were widely scattered between manufacturers far away and with whom he has little or no personal contact.

14. Without the jobber's stocks the contractor-dealer and central-station company would be compelled to carry accounts with forty or fifty manufacturers or suppliers instead of two or three stable jobbers, which would add materially to the cost of doing business and retard efficient operation.

Responsibility

1. The average jobber inventories between 4,000 and 5,000 items representing many classes of material procured from numerous sources of supply. Aside from the economies effected by reason of bringing material in in carload lots and distributing it in less than carload lots, he also provides another economy in the concentration of representation and responsibility.

2. The jobber stands back of the manufacturer's products. The manufacturer may be a thousand miles away, but the consumer knows that the jobber will "make good" at once.

3. The jobber stands responsible for all his transactions, no matter what products may be concerned, and is near at hand and available for all complaints.

4. Confidence in the jobber and the merchandise he handles saves all classes of buyers the expense of individual investigations and tests.

COST OF SERVICE

1. In addition to the quality of service, the cost of service should also be considered. For an ordinary wiring job, involving from twenty-five to fifty items of merchandise, the jobber can make one shipment, with the result that the transportation cost is small in proportion to the value of the shipment.

2. If it were necessary to have this order shipped by the manufacturers, the number of shipments might, in an extreme case, equal the number of items, and to the user of the material the cost of transportation and of handling would be all out of proportion to the value of the goods.

3. The requirements of the average consumer are so small in any one line as to make it unprofitable for the supplier to furnish all his needs. They might fill his largest orders with profit, but not his "pick-up" or "fill-in" needs. The combination, however, of his purchases of all lines, together with his potential purchasing power, makes the consumer an attractive customer for the jobber. The consumer can obtain an assortment of material along similar lines from the jobbers, thus obtaining deliveries in a more economical and expeditious way.

4. The jobber to a large extent absorbs small orders, reducing at the factories warehousing, shipping and office operations.

SERVICE TO MANUFACTURERS

1. The elimination of the jobber would seriously handicap the manufacturer in his operation because of the fact that in the main the jobber discounts his bills and provides the manufacturer with the necessary capital with which to continue his business, whereas, on the other hand, were the manufacturer to sell direct to the dealer, his capital would be tied up for periods from sixty to ninety days, or even longer. This, in turn, would make it necessary for the manufacturer to obtain a greater margin of profit in order to secure a reasonable return on his investment.

2. The jobber directly helps to reduce overhead expenses at the factory as follows: He eliminates all necessity of allowance in manufacturing costs for bad accounts. He reduces the amount of capital needed by carrying slow-paying accounts. He eliminates the expense of a credit department.

3. The existence of the electrical jobber permits the manufacturer to arrange a definite uniform production rate on standard items, resulting in minimum manufacturing costs, a stable factory force and a regular schedule for purchase of raw materials.

4. Among the benefits which the manufacturers derive from the jobbers are purchases in large quantities, with the resultant lower manufacturing costs and expenses; the reduction in the number of accounts handled, and a reduction in the number of salesmen, all of which make for reduction in the accounting and selling expenses.

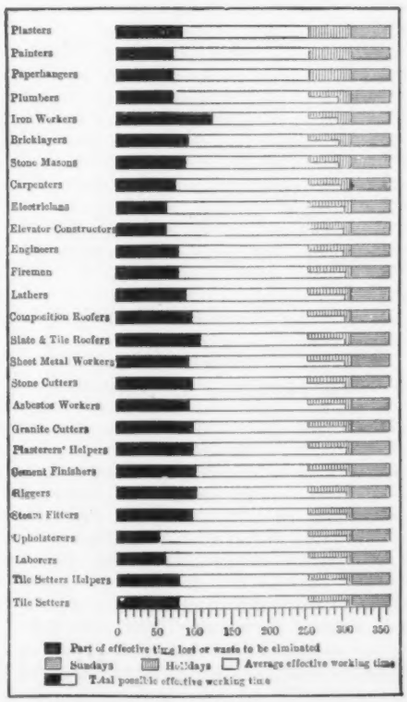
SERVICE OF EDUCATION

1. The proper and efficient distribution of supplies in a given locality is of course largely dependent upon a thorough understanding of the conditions and requirements of the locality, and here again the jobber functions in a most important service to the industry as well as the public.

2. It is recognized that much of the potential development of the electrical industry can be accomplished through developing retail distribution. The jobber, by personal contact and by intimate knowledge of his territory, is in far better position than the distantly located manufacturer to educate the retailer along lines of better merchandising, selling, advertising and finance.

3. Education in the conduct of the business of the dealer covers all branches of the trade, including service and finance, this education being always directed toward doing business in a businesslike way and assisting the dealer in the proper conduct of his business. Here, again, the personal contact of the jobber is effective, as by such contact the dealer can be educated in proper merchandising.

A Picture of Time Waste in Industry



Local Trade Needs Selective Development

BY A MANUFACTURER

ONE of the things that the electrical business needs above all others is the development of more contractor-dealers who are skilled in their work, enterprising and well founded financially, and therefore prosperous. There are many of this kind scattered through the country, but there are many more who are not prospering, and it is time that the manufacturers and jobbers of America realized that it is their responsibility and their job to build up more strong dealers and let more weak ones die.

Here is a picture of the typical situation in a town where there are, say, six contractor-dealers:

A is a small man but a good one. He is a worker. He takes care of his customers. He pays his bills. But he has too little capital and too much competition. He cannot afford to advertise and expand enough to walk away from the others, and so he has to be content with a small share of the business in spite of the fact that he has more real merchandising ability than any other man in town.

B is a good man too, though he is more a wireman than a merchant.

He has come up from helper to wireman to boss through the construction end of the business, and does good work and gets a price that pays a profit. But he has never developed much system or organization. He is a typical small contractor who doesn't push his wiring business as he should and beyond the stock of a few appliances pays little attention to business.

C is a dealer with a dirty, ill-kept store that has no hope of prosperity because its owner has no imagination and no enterprise. He buys all the cheap stuff he can pick up and cuts the price when he gets a chance.

D does both a wiring and an appliance business, dividing his attention between them as the notion strikes him and never pushing either line enough to make it go. He owes a lot of money and wastes much of his time feeding the wolf.

These are the contractor-dealers in this town—these four and two more who are screw-driver electricians pure and simple — and whose fault is it? It is the fault of the manufacturers and the fault of the jobbers. In this town there is one man who could be developed into a successful appliance merchant and one man who could become a prosperous wiring contractor for whom the other four might better be working. But, instead of supporting A as an appliance distributor and helping B to build and broaden out his contracting enterprise, the manufacturers and jobbers whose salesmen are traveling to that town are selling to C and D and the other two and maintaining them in business as competitors of the only pair that are really deserving of encouragement and help. They keep on supplying articles to these "lame ducks," permitting them to get extra time on collections, small-order shipments and sales helps out of all proportion to their merits, without hope or prospect of their ever amounting to anything as an outlet for goods.

The result is that the available business in that town is divided between six instead of two and nobody can make profit enough to really get anywhere. Yet if A and B had all the business between them, they could employ the other four and all their help at better wages and with more security. With the resources combined they would become two real distributors, for they would create business and stimulate sales, and the progress of electrical development in that town would be hastened and prospered.

This is something that the manufacturer and the jobber should think about. It is their fault, and they have got to overcome it, not by waiting for a new generation of dealers or by complaining about things as they are, but by deliberately selecting as their customers the kind of men who have a chance to win. Those are the men to help with credit, stock and publicity. Let us stop propping up the weaklings and keeping them in competition with the men who really deserve support.

Survey of Business Conditions

Optimistic About Future

A canvass of fifteen district sales offices of the Westinghouse Electric & Manufacturing Company at the beginning of September as to the outlook for future months' business showed distinct encouragement. Of the fifteen managers, eleven expressed the opinion, after careful analyses of their territories, that the electrical business would show much improvement during the next twelve months over the preceding period of 1922 and 1921, and the remaining four contended that the electrical business will hold its own.

Motor Sales in Middle West Show Improvement

Motor sales in Chicago and the Middle West for August and September have been active. Reports from five manufacturers indicate that the rate of sales on small-sized motors has been affected very little by the usual summer slump in trade. Motors under 10 hp. are included in this classification. The best sales were on the 3-hp. to 5-hp. motors, which were sold to manufacturers of unit-drive motorized machinery.

One company tells of a good volume sold for pump and elevator use. The demand for larger sizes has been fair but spotted, depending upon prices and time of delivery. With the cost of labor advanced 10 per cent over that of last January added to the increased cost of raw materials, prices are tending upward and remain firm. Stocks of all companies are good, although those of the smaller sizes are a little spotted.

Wiring Devices Reported in Healthy Demand

Improving sales of wiring supplies are bettering conditions among manufacturers and distributors of this class of material. The growth of building operations in various parts of the country has stimulated the demand to a volume considerably in excess of last year's. Stocks of finished material which were made up during the spring and summer have been drawn down to some extent, and at present there are enough nearly finished items in hand to make the delivery situation highly satisfactory.

Raw materials are in reasonable supply barring steel, and considerable attention to orders is being paid by manufacturers lest deliveries fall too far behind. Porcelain is being shipped more regularly, and brass is readily obtainable, the proximity of many wiring-device makers to the mills being a favorable factor. Prices of raw material are firm and tend toward higher quotations in steel.

Leading factories are now operating full time, which means about fifty hours per week in Connecticut establishments. More employees have been taken on within the past few months. Export business is looking better, especially for heavy-duty switches. Prices are firm, but manufacturers are apparently trying to increase their present volume of business without stiffening quotations to jobbers. Collections are being very sharply watched, and distributors' trade acceptances are being received more and more by wiring-device producers.

Manufacturers' Foreign Trade Will Be Expanded

Optimistic answers have been received by the American Manufacturers' Export Association to the inquiry it sent out to its members asking what they found to be the outlook for expansion of business abroad in their several lines of trade. Practically no exception to the general attitude of confidence was found in the numerous replies received.

The Otis Elevator Company, manufacturer of electrically driven elevators, reports as follows: "We can say that whereas the amount of actual new business has been falling off slightly in the last two months, 1922 thus far is ahead of 1921. In addition, indications are, when judged from the number of new inquiries we are receiving daily, that a very satisfactory quantity of new orders should be received before the end of the present year. The inquiries are diversified as to countries, coming from all the South American republics, China and Japan."

"The conclusion to be drawn from letters is that the large volume of orders canceled during 1920 and 1921 is

now at last coming on the market, and that the steady effort to push the sale of American-made goods abroad is at last bearing fruit," says a statement issued by the association. "Some of the replies show a surprising volume of business being conducted at the present time."

Prevailing Conditions Affecting Cost and Volume

Bank Clearings.—The volume of bank clearings decreased this week, as compared with that of last week, but the total of $6,175,597,000 at twenty cities in the United States represents a gain of 8.1 per cent over the $5,715,-124,000 reported to *Dun's Review* a year ago. A continued loss—15.9 per cent in the present instance—appears in comparison with the figures of 1920, however, the clearings for the same week of that year being $7,343,611,291. Only one of the cities included in the statement reports smaller clearings this week than a year ago, a reduction of 11.4 per cent occurring at Kansas City, Mo. With increases at all other centers, ranging from 1 per cent at Louisville to 39 per cent at Detroit, the current week's clearings at points outside of New York—$2,382,597,000—are 14.8 per cent in excess of the $2,075,-424,000 of this period of 1921. At $3,793,000,000 this week's total of New York City is 4.2 per cent larger than the $3,639,700,000 of a year ago.

Failures.—Whereas last week all sections of the United States except the Pacific showed increases, this week all except the Pacific showed decreases in the number of failures reported to R. G. Dun & Company. This week's total was 380, compared with 410 in the previous week and 369 in the corresponding period a year ago.

A decrease was evident also in the number and proportion of the defaults with liabilities of more than $5,000 in each case. This week 214 was the total, which was 56.3 per cent of all for the week, while in the preceding period the corresponding aggregate was 244 and the percentage 59.5. A year ago 203 similar insolvencies were 55 per cent of the total.

Issues Foreign Trade Handbook

A handbook on foreign trade has just been issued by the foreign commerce department of the Chamber of Commerce of the United States. Within the space of thirty-one pages this publication condenses a mine of information as to sources of service in foreign trade. Its alphabetical arrangement makes it a handy reference work for the busy exporter or importer. The book contains also a list of the topics of national importance that are engaging the attention of the National Chamber's foreign commerce department committee under the chairmanship of Willis H. Booth of New York City.

Jobber Sees Advance in Armored Cable Prices

That the present price of armored conductor cannot be held much longer and that quotations will soon be higher is the prediction of a bulletin just issued by the Newark Electrical Supply Company, 223 Market Street, Newark, N. J., to dealers in the Eastern territory.

The bulletin says in part: "There is no question but that the bottom has been reached in so far as prices on the general line of wiring materials is concerned. Prices on copper wire and pipe have already turned upward; some armored cable is sold right now at less than what it cost to manufacture it, and any one who has some money to invest had better buy what cable he may need in the next two or three months, as an increase is sure to be announced in the course of the next week or ten days. The present price for armored cable cannot be held much longer. Prices on appliances as well as radio material are expected to remain firm the rest of the year."

Push Flush Switches Improve

Current sales of push flush switches compared with those of six months ago are improving, according to important manufacturers in the field. No price changes are expected.

A producer in Connecticut says: "Our current sales of push flush switches as compared with those of six months ago show a slight increase. Our deliveries are normal. No price changes have recently been made on this line of material, nor does it look as though there would be any in the near future. The outlook for sales on this line for the next six months is good because of the large volume of new building going on."

Another states: "Deliveries are still normal. There will probably be a slight slowing up of deliveries as the demand continues to increase this fall. Prices have just changed on one or two devices. It is an open question whether other changes will be necessary. We look for a gradual increase in this line of business for at least nine months as a natural result of the increase in building throughout the country."

Better Tone in New England Collections

Jobbers report a very perceptible improvement in collections during September as compared with August, and with increasing sales this fall in virtually all lines of business and industry easier credit conditions are anticipated. Banking conditions are much improved. Railroads purchasing electric material are settling their accounts more promptly than for a long time; central-station payments are satisfactorily regular, and industrial concerns are meeting their obligations more readily. A fair average of fifty-five to sixty days is being reported for settlements in jobbing circles. Collections among contractor-dealers are spotty, according to representative distributors, but some of the delays experienced are due to the absorption of contractors in wiring jobs, business being very active in the building field.

The Metal Market

Domestic Buying Improved—Producers Reluctant to Sell Far Ahead—Surplus Decrease Continues

Buying of domestic copper is improved. Inquiries from the brass and the electrical industry are somewhat better than those from the wire mills. There is considerable demand for shipments into the first quarter of 1923 at present quotations. Producers, however, are reluctant to sell that far ahead at 14 cents, as many now expect an advance of ¼ to ½ cent before the end of the year. Because of this long-held price level of 14 cents the trade feels that something is bound to happen soon to vary the situation.

The continued decrease of the copper surplus in this country at an average rate of 30,000,000 lb. monthly has brought down stocks of refined copper to less than 275,000,000 lb., of which between 150,000,000 lb. and 160,000,000 lb. is held by the Copper Export Association. In some quarters it is estimated that sales in September totaled 120,000,000 lb., which brings the total so far this year up to 1,200,000,000 lb. Average sales for the second quarter are put at 163,000,000 lb. monthly, while those during the third quarter show a sharp decline to a monthly average of 120,000,000 lb.

The antimony market remains unchanged. A few isolated parcels can still be had in the outside market at 7 cents a pound, f.o.b. New York.

No new business has been done in manganese lately and none is expected for several months to come. A few cargoes are still on the water and will be subject to the high duty of 1 cent per pound on the manganese contents.

Of all the ores, probably tungsten was the first to feel the effect of the new tariff. Prior to the tariff enactment comparatively little business was done with the actual consumers in either the ore or the ferros. What business has been reported in recent months has been done mostly by importers who were willing to take the risk of the arrival of the material. The tariff, however, being in effect, caused actual consumers to come heavily in the market, and the price for tungsten ore, which but two months ago was $3 per unit, has now reached $7.50 per unit sellers and $7 per unit actually paid.

It is difficult to give any actual price at which ferro tungsten can be bought. Prices ranging from 70 cents to 85 cents per pound are reported, and somewhere between these figures lies the actual market. Tungsten metal powder of a good quality is scarce and is quoted at 90 cents to $1 per pound.

The Week in Trade

Prices When Quoted Are Those Reported at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for All Eastern Points

THE electrical market continues its steady increase. Jobbers are buying in conservative amounts and most of them express optimism concerning the coming fall and winter months. Central-station business shows decided improvement over the corresponding period of last year. Poles and line hardware are selling most actively as much repair work and the construction of new lines are being undertaken by power companies. Motors in the smaller sizes are selling actively. Better sales in the hollow-ware field are reported.

New York

Radio Stocks Very Heavy—Meter Sales Falling Off—Fixtures Sales Are Steady

Business in the electrical industry is steady. Sales of hollow ware are increasing steadily but have not reached the even stride that is expected within a few weeks.

Radio.—Business is reported even. A gradual pick-up is expected before the end of the month. Stocks are very heavy.

Meters.—A falling off in the sale of residential meters is reported this week. Stocks are only fair.

Electric Heaters.—Jobbers are stocking up in anticipation of large sales during November. A slight stiffening in prices is noted.

Fixtures.—All kinds of fixtures are selling steadily. Stocks are heavy and prices firm.

Chicago

Motor Sales Increasing, with Smaller Sizes Most Popular—Wiring Material Demand Steady

Electrical business for this territory has changed very little, although wiring materials are moving at a constant rate. Manufacturers of high-tension equipment are actively engaged in filling orders.

Wire.—The week's sale of rubber-covered has been active, according to most jobbers. No. 14 sells for $6.25 per 1,000 ft. in lots of 5,000 ft. Stocks are in good shape. Prices on bare and weatherproof wire vary between 16½ cents and 17 cents per pound.

Flexible Armored Conductor.—A fair call is noted and the No. 14 two-wire, single-strip, is available in 5,000-ft. lots for $48 per 1,000 ft. The supply is good.

High-Tension Equipment.—Manufacturers are reporting active sales. One company disposed of three 33,000-volt, 600-kva. outdoor substations for a utility in the Middle West. A steady sale of high-tension fuses is reported by another firm.

Motors.—Sales on small motors for August and September have been active according to reports from five manufacturers. In most cases the usual summer slump was felt only slightly, but sales in general have been better than some had previously expected.

Boston

Conduit Prices Firm—Wire Moving Actively—Heater Sales Increasing—Socket Trade Better

New England business is steadily gaining, both industrial and mercantile conditions exhibiting healthy improvement over the summer. Building and engineering contracts for the week ended Sept. 26 totaled $6,335,900 against $4,379,500 a year ago. The textile, leather and paper industries report better trade, and metal-working plants are more active.

Rigid Conduit.—Prices are firm and the recent shortage of smaller sizes has been overcome. It is hard to obtain 2-in. pipe and upward in any quantity.

Wire.—Rubber-covered wire is moving actively, with ample supplies but little opportunity to build up stocks. No. 14 quotes $6.25 per 1,000 ft. in 5,000-ft. lots. Weatherproof is moving slowly but steadily on 17 cents bases. Bare copper wire is very dull, although interest in smaller sizes for radio installations is picking up a little.

Heaters.—Retail sales are extremely active and jobbers' stocks are cut low by recent demand. Factory production is heavy in volume. One manufacturer reports ability to ship occasional carload sales, but stocks are greatly reduced. Some lower-priced units are in the market, but the demand for all reliable makes is so great that competition is scarcely acute.

Sockets.—Trade is better and deliveries excellent. Prices are firm, pulls in case lots being quoted at 32.5 cents net, keys at 18.5 cents and keyless at 17 cents each. Interior wiring is very active in eastern Massachusetts.

Atlanta

Knobs and Tubes Continue in Heavy Demand—Jobbers' Stocks of Batteries Are Fair

Continued betterment of conditions is noticeable. The settlement of the rail strike is in a great measure responsible for the great improvement in the mental attitude, the feeling of uncertainty that was so pronounced a few weeks ago having disappeared.

Porcelain.—Knobs and tubes continue to be in heavy demand, with insufficient stocks to take care of the situation unless rail shipments materially improve.

High-Tension Transformers.—There is a fair demand for the 11,000-volt to 38,000-volt oil-cooled types, with prospects good for an increased market by spring. The larger central-station companies have placed very satisfactory orders for heavy equipment of the higher rating, with prospects for additional purchases of this material in the near future.

Distribution Transformers.—Only a fair volume of business is reported, the general depression which has existed until of late in the rural districts having served to slow down purchases. The small distribution systems have shown little growth throughout last year, but the prospects are bright.

Dry Batteries.—The usual fall movement in this line is to be noted, with rural districts taking a fair quantity of goods. Jobbers' stocks are in good condition, with shipments satisfactory but deliveries slow.

Schedule Material.—Satisfactory sales are reported throughout the entire line, owing to the large number of stores and homes under construction. Sockets are reported particularly good.

St. Louis

Contractors Increasing Orders—Porcelain Stocks Ample—Lighting Fixtures Active—Portable Lamps Slow

Business in electrical supplies is about 8.8 per cent better than a year ago and about on a level with the preceding months of this year, according to reports obtained by the St. Louis Federal Reserve Bank. There has been a marked improvement in sales of equipment and supplies in the coal-mining section since the settlement of the strike. Contractors are increasing their orders, and all varieties of goods employed in new buildings continue in strong demand.

Porcelain.—Ample stocks are on hand. Prices are tending upward, about 10 per cent higher than a month ago, and some jobbers report slight declines in demand, though general construction work is quite active.

Bell-Ringing Transformers.—Somewhat better demand is reported, but total movement is comparatively small. Prices are steady with stocks conservatively maintained.

Lighting Fixtures.—Exceptionally good business has existed for several months and will probably continue because of the volume of construction under contemplation. Schools, churches, lodge buildings, hospitals and hotels have been heavy buyers. Prices are firm, with increasing tendencies. Industrial fixtures are quiet.

Portable Lamps.—Retail purchasing is not active, but dealers are placing orders for the holiday trade. Stocks

have been kept low and present orders are conservative, though it is expected the volume of trade this year will be at least equal to that of last year. Delivery conditions are considered satisfactory.

Cleveland

Weatherproof Wire Active—Small Heaters Moving Rapidly from Well-Stocked Shelves

Wire.—Weatherproof has been the most active, but orders are few and prices unchanged. No. 14 rubber-covered has experienced a slight increase in demand. Bare wire is inactive. Deliveries are prompt.

Conduit.—A continued shortage of the smaller pipe and an active demand has tended to stiffen quotations. Deliveries are slow.

Flexible Armored Conductor.—A slight increase in demand has lessened stocks a bit, but an abundant supply remains. Prices are firm with fair deliveries.

Motors.—Sales have been active in the smaller type, but no greater than anticipated. Unchanged prices and prompt deliveries indicate a satisfactory supply.

Radio Equipment.—General sluggishness prevails, but jobbers are hopeful that greater interest in radio will result from regulation of broadcasting.

Radiators.—The abrupt precipitation into fall weather has invigorated this market appreciably. The small heaters are moving rapidly but from well-stocked shelves.

Portland-Seattle

Jobbers Report Business Keeping Up in Splendid Shape—Radio-Equipment Demand Improving

The electrical interests of Tacoma have just concluded a highly successful electrical show, while the Electric Club of Seattle is very busy attending to visitors at its two electrical homes. Work is progressing rapidly on a transmission line about one hundred miles in length between the White River plant of the Puget Sound Power & Light Company at Derringer and Wenatchee, Wash.

Electrical jobbers report that business is keeping up in splendid shape. Demand seems to be very active in all lines and stocks generally are in fair condition with the exception of conduit. Heavy demand and some difficulty in securing shipments have caused quite a serious shortage in the smaller sizes of conduit. An advance in price of about 8 per cent is reported in loom and porcelain. Increasing interest in farm-lighting sets has been reported, also greater activity in air-heater equipment and lamps. The demand for radio equipment is again improving.

Shortage of water power has caused heavy use of steam generation for the past few weeks. Recent rains, however, have relieved the situation somewhat. Generation for the Portland district for the month of September was 15 per cent greater than for September, 1921.

Salt Lake City

Important Central Stations Planning Immediate Expansions — Vacuum-Cleaner Sales Reported Satisfactory

Important central-station companies are planning immediate extension of power lines and erection of new generating hydro-electric plants. Favorable weather conditions promise the continuation of home building to a date late in autumn.

The trend of wage schedules is upward, with builders and artisans in good demand.

Retail buying shows a 5 per cent increase for the past eight months. The metal market is firm and the price schedules warrant expansion and production up to capacity.

Vacuum Cleaners and Washers.—These appliances are being vigorously advertised, and reports indicate that sales are satisfactory.

San Francisco

Schedule Material Sales Very Active — Rigid Conduit Continues to Advance—Lamps Brisk

Schedule Material.—Sales have never been better, although the higher prices received during the war period may possibly overtop the value of present sales. All schedule stocks are turning over nicely.

Conduit.—Rigid continues to advance. Shipments from the East are very slow and far below necessary allotments. Mill production, it is said, is better, but car shortage is now holding up business, with little prospect of immediate relief.

Rubber-covered Wire.—Local stocks are good.

Lamps.—The new prices effective Oct. 1 were quite unexpected. Fall business is opening briskly. Christmas-tree outfit sales are influenced by exceedingly low foreign competition, principally Japanese. An average eight-light series outfit with continuous socket attachment retails for $3.50.

Activities of the Trade

Devoted to News of the
Manufacturer, Jobber, Agent, Contractor and Dealer, Including Important Orders and Contracts for Apparatus and Equipment

Mitchell-Rand Company Reports Gradual Improvement

The Mitchell-Rand Manufacturing Company, 18 Vesey Street, New York City, in a bulletin recently issued, states that during the eight months just ended the electrical industry has witnessed a gradual improvement in underlying conditions, marked by an increasing volume of business, without any great change in prices.

Officials of this company are of the opinion that such changes in prices as may occur will be along lines of adjustment to a more reasonable relation between commodities—a narrowing of the so-called "price spread"—rather than any general advance or decline. The bulletin further says:

"The radio situation is following expected lines. Consumer demand has dropped considerably but will come back just as soon as the long days of summer pass and vacations are over. Many manufacturers of radio apparatus are preparing for a much greater volume of business in the coming months than during the season just past."

Freeman Electric Company Plans Extension to Plant

The Freeman Electric Company, Trenton, N. J., is perfecting plans for extensions in its plant to include a new building on Prince Street and the removal of the present works on East State Street to the new location. Equipment will be provided for the manufacture of switches, metal-jacketed sockets, cut-outs and kindred specialties. Edgar H. Freeman is head of the company.

Southern Tier Electrical Supply Closes Retail Department

Announcement is made by the Southern Tier Electrical Supply Company, Binghamton, N. Y., that it now sells in wholesale amounts only, having recently closed its retail department. Among the recent changes in the company have been an enlargement of its warehouse and the appointment of a sales representative in Scranton, Pa.

Westinghouse Makes Numerous Changes in District Offices

Important changes, affecting a number of district offices, have been announced by the Westinghouse Electric & Manufacturing Company. The changes, including the establishment of a merchandising division in many of the offices to co-operate with the new merchandising department established several months ago, have been made to keep pace with increased business and seem to indicate a definite upward trend in business conditions, officials state. The district offices affected by the appointments are New York, Buffalo, San Francisco, St. Louis, Atlanta, Seattle, Chicago and Boston.

The changes affecting the New York

and Buffalo offices have been made for the purpose of furnishing better service to customers in those districts. C. W. Underwood, manager of the Buffalo office, has been appointed Northern representative, with offices in Buffalo. The territory of the Buffalo office has been united with that of the New York office, and A. E. Allen, manager of the New York office, will have charge of the Buffalo office also.

Other changes affecting these two offices include the appointment of W. R. Marshall as branch manager of the Buffalo office, of E. W. Loomis as manager of the industrial division of the New York office, of W. A. Rossell as special power representative of the combined districts and of G. T. Dunklin as manager of the merchandising division of the New York office. The supply and power divisions of the New York office have been merged into the central station division under C. E. Stephens, manager, and the present railway division will in the future be known as the transportation division.

In the San Francisco office the power division is changed to the central-station division and W. P. L'Hommedieu has been appointed manager. Mr. L'Hommedieu will also be responsible for the sale of supply apparatus in the San Francisco district. The railway division has been changed to the transportation division, and E. A. Palmer has been appointed manager. The establishment of a merchandising division, with H. L. Garbutt as manager, has also been announced.

The appointments of S. W. Perry as chief clerk, of W. F. Barnes as manager of the industrial division, of J. S. Warren as manager of the central-station division and of G. F. Leake as manager of the merchandising division make up the changes made in the St. Louis office.

W. L. Southwell has been made manager of the merchandising division of the Atlanta office.

J. W. Robinson, manager of the central-station division of the Chicago office, has also been assigned the general responsibility for the sale of supply apparatus in the Chicago territory, and W. A. Dalrymple has been made district auditor in the Chicago district.

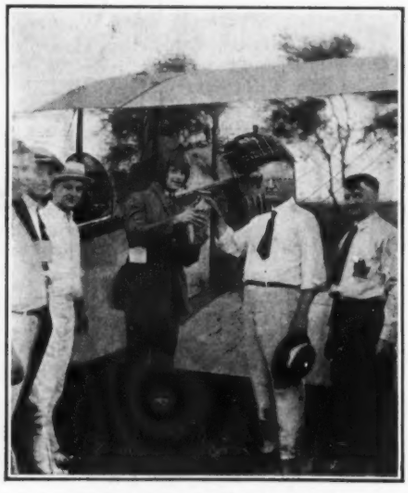
Changes in the Boston office included the establishment of a central-station division, with G. M. Bates as manager and F. L. Nason as assistant manager. A merchandising division has been established in that office with Mr. Nason as acting manager. J. P. Alexander has been appointed manager of the new transportation division in the Boston office.

Joins Sales Staff of Furnace Specialties Company

M. F. King, formerly of the Kings Refractories Company, has joined the sales and service department of the Quigley Furnace Specialties Company, New York City. He will devote his attention to service and sales work in New York City.

Hoover Suction Sweeper Company Holds Sales Convention

The second annual international sales convention of the Hoover Suction Sweeper Company was held last month at North Canton, Ohio. There at the Hoover farm, several miles from city and factory distractions, gathered nearly two hundred of the organization's sales force and officials, representatives from America, Canada, England, Holland and Switzerland. The personnel included sales, advertising, service and engineering officials, district and divisional sales managers, American and foreign, and a number of salesmen who had in the past year exceeded their fixed sales quota and "delivered the blue vase"—symbolic of great achievement—as did "Bill" Peck, celebrated by Peter B. Kyne in his short story "The Go-Getter." Incidentally, this short story had been the



HOOVER SALESMAN DELIVERING "THE BLUE VASE"

inspiration for a sales contest, called the "blue vase contest," which kept these salesmen on the alert all through the spring and summer and finally rewarded them with a trip to the convention.

The convention site lay in a grove where sleeping quarters were afforded the delegates by means of a number of small tents. Meals were served in a large tent, and another canvas-covered area provided a place for the real business of the conference. In this tent sessions were held both morning and afternoon devoted exclusively to the study of methods designed to increase Hoover sales. Qualified sales instructors and officials led the meetings, and every moment was employed. For an hour or more during the evening special sessions were held in smaller tents adjoining the conference headquarters. Here the sales, engineering, advertising and service departments had exhibits portraying the work of each, and departmental officials were on hand to give the field force a more comprehensive knowledge of the way in which the organization functions.

Recreation and amusement were provided. Baseball and volley-ball held sway following the afternoon meetings. There were bathing and boating in a pool adjoining the camp site. Every effort was put forth to insure the comfort of the delegates. The sleeping tents were cool and roomy, and the beds were comfortable. Ample meals were served. The camp was illuminated by electric light, hot and cold running water was provided, and there were a number of shower baths. There was also a barber shop, and a doctor was in attendance for emergencies. Each day a special convention newspaper gave the delegates a résumé of the convention news.

Much enthusiasm was evinced. For the entire week each man's interest was centered on how to make more sales, and he could not help but gain a more thorough knowledge of successful methods of merchandising his product.

The Hoover company held its first convention of this kind in 1921. That session was so successful that plans were immediately laid to make the 1922 affair as attractive and as fruitful as possible. The Hoover people are confident that material results from this second convention will soon manifest themselves on the sales sheets of the company.

An Offer of Co-operation in Foreign Trade

W. L. Urquhart, export sales manager of the Hart & Hegeman Manufacturing Company, Hartford, Conn., manufacturer of electric switches, sockets and wiring materials, announces that he is able to recommend a manufacturer's representative, an individual who is a resident of Johannesburg, South Africa, and who has had a wide experience in the past seven years in the electrical and allied machinery lines. "He is well known in the trade," says Mr. Urquhart, "and in an endeavor to have him specialize on American electrical supplies and thus obtain more intensive working in the electrical trade in South Africa, we would like to bring this to the general attention of all of the electrical firms which are interested in developing this market.

"This opening is especially advantageous to manufacturers of heater appliances, motor appliances, special instruments, pole-line material, batteries, lighting fixtures, glassware, bells, annunciators, fans and specialties. The manufacturer's representative works only on a commission basis."

Philadelphia Jobber to Have Larger Quarters

In order to take care of its increased business and in anticipation of a larger demand for electrical supplies of all kinds, the Frank H. Stewart Electrical Company, Philadelphia, announces that it has purchased and is remodeling to its needs the property adjoining its present quarters.

Steiner Electric Company Increases Floor Space

The Steiner Electric Company, 115 North Wells Street, Chicago, has increased its floor space about 75 per cent. This was accomplished, declared George S. Steiner to a representative of the *Electrical World*, by obtaining the basement as a storage room for stock and by placing the office upon a newly built balcony. The appliance and radio equipment was then placed in shelves on one side of the store up toward the front in order to facilitate more rapid sales and allow more room for display. The other side remained unchanged and contains regular lines of electrical construction material. Several booths exhibiting electrical fixtures were also constructed.

Mr. Steiner also said that his business for September, 1922, averaged an increase of 20 per cent over September, 1921. He felt that both the radio and open-air-heater business would be active this winter and declared that this was one of his reasons for regrouping these commodities.

Broughton Assumes Charge of Apex-Rotarex Department

H. B. Broughton of the Illinois Electric Company of Chicago has recently arrived in Los Angeles and has taken over the Apex-Rotarex sales department of the Illinois Electric Company of Los Angeles. Mr. Broughton was with the Illinois Electric Company of Chicago from 1913 to 1919, going from there to the Northwest, where he was Apex-Rotarex representative for three years. After that he was with the Chicago company prior to assuming his present duties.

Trump Manufacturing Company to Increase Production

The Trump Manufacturing Company, Springfield, Ohio, manufacturer of turbines, has been granted authority by the Secretary of State of Ohio to increase its capital stock from $125,000 to $200,000, according to an announcement made by John J. Hoppes, the company's president.

This step has been taken, Mr. Hoppes said, to increase the company's facilities for taking care of the large volume of business now being offered and for the purpose of installing machinery to reduce operating costs.

Southwest General Electric to Have Larger Quarters

The Southwest General Electric Company, Dallas, Tex., has awarded a contract for the construction of three additional stories to the three-story brick building which it occupies at 601 North Lamar Street. The cost will be $92,000. The top floor will be fitted up as general offices for the company, which will be moved from present quarters in the Interurban Building to its own building.

Three light and air courts to be provided in the building will provide an outside opening and windows in every office or room in the addition. Passenger elevators will be installed for employees. The three floors and basement of the present building and the two lower floors of the three-story addition will be used for storage room.

International Combustion Firm Gets Large New Property

George E. Learnard, president of the International Combustion Engineering Corporation, New York City, has announced the acquisition of the entire capital stock of the Green Engineering Company, East Chicago, Ind., manufacturer of chain-grate stokers, auxiliary boiler-room equipment and special furnace arches. The stockholders of the Green Engineering Company have taken in exchange 47,000 shares of International Combustion Engineering stock in full payment for all of the stock of their company.

It was stated by Mr. Learnard last week that the taking over of the Green Engineering Company was in line with the general policy which has been pursued by the International Combustion Engineering Corporation since its incorporation of adding other lines and plants to take care of its increasing business so that it would at all times be able to offer and manufacture in its own works all types of automatic stokers or other equipment demanded by the consumers of coal and large producers of electric power.

The works of the Green Engineering Company are within 15 miles of Chicago and are served by all the principal railroads entering that city. The company's plant covers about 12 acres and is equipped with all modern labor-saving machinery, approximately 50 per cent of the entire plant having been built within the last three years. The company's plant and inventory is conservatively valued at slightly under $1,000,000, with more than $500,000 cash on hand and with accounts payable of less than $50,000.

The official announcement adds: "The International Combustion Company has for a long time considered it desirable to have a large manufacturing plant in the Middle West to handle its constantly increasing business in that section of the country. This plant is now greatly needed not only for automatic-stoker business, but also to provide facilities for the manufacture of the equipment used in the rapid growth of the pulverized-fuel department. This plant, owing to its location, will also provide manufacturing facilities for the subsidiaries of the International Engineering Company and will thereby effect greater economies in the operation of its business in America.

"The Green Engineering Company is one of the oldest concerns in the United States manufacturing stoker and boiler-room equipment. P. Albert Poppenhusen, who will remain with the company, has for twenty-five years been the active head of the concern. It is proposed by the company to continue the operation of the Green Engineering Company on an independent basis, and Mr. Poppenhusen, who is closely connected with some of the largest power and public utility developments in the country, will give his entire time to the further development and enlargement of its business. The Green Engineering Company will continue to manufacture the equipment which it has been selling and installing in this country and will add to its present line other apparatus for the economical burning of fuels. This equipment is now being manufactured by the foreign subsidiaries of the International Combustion Engineering Corporation."

The General Electric Company, through its president, Gerard Swope, has announced that a bonus of 5 per cent in cash or securities redeemable in cash will be paid to each employee receiving compensation of $4,000 or less annually who has completed five years or more of continuous service at Jan. 1 or July 1 of each year.

The Abbott-Stuart Sign Company, 2814 Main Street, Dallas, Tex., is planning for the establishment of a new plant for the manufacture of electric signs and operating displays.

Johns-Manville, Inc., New York City, announces that it has been appointed a selling agent by the H. H. Robertson Company, Ambridge, Pa., for the distribution of asbestos-protected metal products.

The Johns-Pratt Company, Hartford, Conn., manufacturer of fuses and protective devices, announces the appointment of G. V. W. Ingham as Eastern sales manager for its electrical division. He will make his headquarters at the New York City office of the company. Mr. Ingham formerly was with the Bryant Electric Company as Eastern sales manager. Prior to that time he was associated with Pass & Seymour, Inc., as Western sales agent.

The Square D Company, Detroit, Mich., manufacturer of safety devices, announces that it has appointed R. J. Parisian as district sales manager in the Cleveland territory. The Cleveland district office serves not only the Cleveland territory, but Pittsburgh, Buffalo and Syracuse territories as well.

The F. S. Pearson Engineering Corporation, Fisk Building, New York City, announces that it has re-established its department for industrial management and technical auditing of industries. This department will be managed by the firm, along with its usual work of financing, developing, design and construction of engineering projects and industrial plants.

The Clark Electric & Manufacturing Company, 24 Vanderbilt Avenue, Brooklyn, N. Y., has disposed of its two-story brass foundry and machine shop, 75 ft. x 100 ft., at 22 Vanderbilt Avenue, equipped for service, to Smith & McCrorken, Inc., which will use the plant for the manufacture of brass, bronze and other metal castings.

Foreign Trade Notes

THE SOCIETA ELETTRICA DEL PIACENTINO, Salerno, Italy, has been organized with a capital stock of 250,000 lire, according to the *Electrical Review*, for the purpose of utilizing the water power of the River Piacentino to generate and distribute electricity.

EXTENSIONS CONTEMPLATED TO ELECTRIC PLANT AT NEWCASTLE, AUSTRALIA.—To meet the increasing demand for electrical service the City Council of Newcastle, New South Wales, Australia, the *Electrician* states, has decided to appropriate £50,000 for extensions and improvements to the municipal electric plant and system.

AUTOMATIC TELEPHONE EXCHANGES TO BE INSTALLED IN STOKE-ON-TRENT, ENGLAND.—Decision has been reached, according to *Commerce Reports*, to replace the present system of manual telephone exchanges in the Stoke-on-Trent area with those of automatic type, the substitution to be completed by April 1, 1925. The cost is estimated at between £50,000 and £80,000.

EXTENSION TO ELECTRIC SERVICE IN AUCKLAND, NEW ZEALAND. — The ratepayers have voted, *Commerce Reports* states, to extend the Electric Power Board's service through the outlying districts. To install this service it is proposed to raise a loan of £600,000, part of the proceeds to be used in defraying the consumers' expenses in installing the system.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

Equipment is desired in Switzerland (No. 3,726) for hydro-electric power plants, including turbines, electrical equipment and especially high-pressure steel pipes.

The purchase of fiber conduits is desired in Norway (No. 3,745).

Telephone equipment is desired in Spain (No. 3,765) for installation in offices and dwellings.

An agency is desired in Australia (No. 3,781) for wireless telephones, new ideas in electrical and motor car fittings, etc.

Telephone posts, wooden crossheads for telephone posts, pins and aërial telephone wires are desired in the Canary Islands (No. 3,784).

The purchase of electric washers is desired in Canada (No. 3,788).

The purchase and sole agency is desired in India (No. 3,789) of electrical fittings and fans, etc.

An agency is desired in Lithuania (No. 3,790) for electrical equipment for power stations.

Telephone and telegraph material, including telephones, bells, wire, insulators, nails, cross-arms, etc., is desired in Mexico (No. 3,792).

The purchase and agency is desired in Canada (No. 3,793) of electrically driven ice-cream freezers of 10 gal. to 20 gal. capacity and also of necessities and specialties which are used in the manufacture of ice cream.

Purchase is desired in England (No. 3,799) of electrical porcelains of the highest quality, high and low tension, which are especially manufactured to drawings or samples.

CONTRACT APPROVED FOR CARTAGENA (COLOMBIA) ELECTRIC PLANT. —The Municipal Council of Cartagena, according to *Commerce Reports*, has approved the bases for a contract with the Cartagena Water Works, Ltd., for extension of the water system and the construction of an electric light plant in connection with the proposed reservoir. The municipality reserves the right to purchase the waterworks system and electric plant.

CONCESSION FOR AN ELECTRIC PLANT IN CUBA.—The Secretary of Public Works of the Cuban government, by decree No. 1,285, dated Sept. 11, 1922, *Commerce Reports* states, has authorized the construction of an electric plant at Taguasco, in the Province of Santa Clara. All details may be obtained from the concessionnaire, whose name will be furnished to American firms interested in submitting offers for this work by the Electrical Equipment Division of the Bureau of Foreign and Domestic Commerce, Washington, D. C.

HYDRO-ELECTRIC SCHEME PROPOSED FOR TAUMARUNUI, NEW ZEALAND.—Arrangements have been made by the Borough Council of Taumarunui, according to the *Electrical Review*, for a loan of £47,000 for a municipal hydro-electric project. The plans provide for 18,000 hp.

TURBO-GENERATOR FOR MONTEVIDEO, URUGUAY.—Tenders will be received by the State Electricity Department, Montevideo, Uruguay, until Nov. 11, the *Electrical Review* states, for one 10,000-kw. turbo-generator. Bids will also be received until Nov. 4 for 66,000 m. of high-tension cable and accessories.

ELECTRIC EQUIPMENT FOR MANFALOUT, AFRICA.—Tenders will be received by the Director of Technical Service, Section of Municipalities and Local Commissions, Savoy House, Cairo, Africa, until Nov. 15, according to the *Electrician*, for equipment for generating station and distribution system.

New Apparatus and Publications

SCHOOL LIGHTING.—The engineering department of the Holophane Glass Company, New York City, has issued a thirty-six-page illustrated booklet entitled "Modern School Lighting."

DEVICES FOR CEILING LIGHTS. — Pass & Seymour, Inc., Solvay, N. Y., are placing on the market three devices for use with ceiling lights, ceiling bands and in fact any standard or special unit. They fit the standard 1⅛-in. throat of the ceiling units and provide individual control.

CLAY PRODUCTS.—Industrial Publications, Inc., 407 South Dearborn Street, Chicago, has published the 1922 "Clay Products Cyclopedia." The book consists of two main parts, the first containing information on definitions and statistics, and the second catalog pages of the manufacturers of equipment.

GRAPHIC WATTMETERS.—The Esterline-Angus Company, Indianapolis, Ind., has issued bulletin 722, describing graphic wattmeter checks.

PLATING APPARATUS.—The U. S. Galvanizing & Plating Equipment Corporation, Brooklyn, N. Y., has issued bulletins on plating apparatus.

RECTIFIER SET.—The Mueller Electric Company, Cleveland, has issued a pamphlet describing a rectifier set.

VACUUM HEATING PUMP.—The Nash Engineering Company, South Norwalk, Conn., has issued bulletin 25, describing the Jennings Hytor vacuum heating pump, size M, electrically driven.

COMMUTATOR LATHE. — George Bender, 122 Center Street, New York City, is introducing a new commutator lathe for turning commutators of motors and dynamos.

OPEN FEED-WATER HEATERS.—The H. S. B. W. Cochrane Corporation, Philadelphia, has issued a combined catalog describing its various lines of open feed-water heaters, V-notch meters, metering heaters, flow meters for fluids in pipes, water softeners, including both hot process and cold process, pressure filters, back-pressure valves, steam and oil separators and drainers or traps.

PORTABLE POWER STAND. — A new portable power stand has been developed by the Westinghouse Electric & Manufacturing Company to supply motive power for the various appliances found in every-day use on farms and in stores, garages and small machine shops.

New Incorporations

THE LIBERTY LIGHT & WATER COMPANY, Roanoke, Va., has been incorporated with a capital stock of $100,000. The officers are M. C. Hughson, president, and F. M. Hughson, secretary.

THE SAYBROOK LIGHT, POWER & WATER COMPANY, Ashtabula, Ohio, has been incorporated with a capital stock of $10,000 by J. P. Dodge, L. Heath, E. D. Richards, Max E. Fros and C. R. Busse.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

ELIOT, ME.—The Public Utilities Commission has authorized the Kittery Electric Light Company to extend its transmission lines in the town of Eliot.

WHITINGHAM, VT.—The New England Power Company, Worcester, Mass., has awarded contract for construction of its power station at Whitingham to the L. H. Shattuck Company, Manchester, N. H. The station will have a capacity of 45,000 kva.

LOWELL, MASS.—The contract for the construction of a new power house for the Hamilton Manufacturing Company has been awarded to the William T. Reed Company.

WATERTOWN, MASS. — The Edison Electric Illuminating Company will erect a substation on Spring Street, to cost about $22,000.

WINCHENDON, MASS. — William K. Brown & Son, 420 Central Street, will build a one-story power house at their local factory, 36 ft. x 50 ft .

OAKLAND BEACH, R. I.—The installation of a new lighting system at Oakland Beach, to cost about $15,000, is under consideration. The plans call for 100 standards mounted with five-lamp clusters.

WOODMONT, CONN.—The United Illuminating Company, New Haven, has been awarded a contract for lighting the streets of the borough with electricity. The contract calls for eighty-six lamps, which will replace the gas lamps now in use.

Middle Atlantic States

BUFFALO, N. Y.—The Chevrolet Motor Car Company, Detroit, will build a power house in connection with its proposed local plant, to cost about $600,000.

BUFFALO, N. Y.—A new street-lighting system will be installed on Walden Avenue.

BROOKLYN, N. Y.—The Superior Ice Company, 50 East Forty-second Street, New York, will construct an ice-manufacturing plant at Avenue Z, Sheepshead Bay, to cost about $250,000. The plant will be equipped throughout with electrically operated machinery. Waldemar Mortensen, 209 West Seventy-sixth Street, New York, is engineer.

CREEDMOOR, N. Y.—Bids will be received by the State Hospital Commission, 25 Broadway, New York City, until Oct. 31, for construction of central lighting and heating plant, kitchen and dining-room building, buildings for chronic patients (north and south) and tunnels at the Creedmoor division of the Brooklyn State Hospital, Creedmoor (post office address Jamaica). L. M. Farrington is secretary of commission.

LONG ISLAND CITY, N. Y.—The National Sugar Refining Company will build a one-story power-house addition, 24 ft. x 52 ft., at its local plant.

MADRID, N. Y. — The St. Lawrence Transmission Company, Potsdam, which recently purchased the system of the Madrid Electric Light Company, is reported to be contemplating erecting a transmission line from Madrid to Waddington, a distance of 8 miles, to supply electrical service there.

NEW YORK, N. Y.—The Long Island Railroad Company is preparing tentative plans for the electrification of its Montauk Division to Babylon, to include substations, feeder lines and additional power-plant equipment.

RENSSELAER, N. Y. — The Albany Southern Railroad & Power Company will install a new street-lighting system on lower Broadway, maintained by underground wires.

TUPPER LAKE, N. Y. — Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Oct. 11 for erection of buildings at the United States Veterans' Bureau Hospital, Tupper Lake, including electric light and power system, telephones and call bells.

BERNARDSVILLE, N. J. — The New Jersey Power & Light Company will install a new lighting system on the Boulevard Road, from Prospect Street to Simpson's Corner, Basking Ridge.

CLIFTON, N. J.—A power house will be constructed by Cupra, Inc., at its proposed artificial silk-manufacturing plant, to cost about $100,000. The Technical Advisory Corporation, 132 Nassau Street, New York, is architect and engineer.

JERSEY CITY, N. J.—The Public Service Corporation will build a one-story switch house at its power plant, foot of Duffield Avenue, to cost about $40,000.

LAMBERTVILLE, N. J.—The Merchants' Association is negotiating with the Eureka Power Company for the extension of its lines from New Hope to Lambertville to furnish electrical service here.

RAHWAY, N. J.—The Council has appointed a committee to secure estimates of cost of a municipal lighting plant.

TRENTON, N. J.—The board of directors of the Mercer Hospital have authorized the construction of a new power house, 50 ft. x 35 ft., and laundry building, 100 ft. x 35 ft.

ALLENTOWN, PA. — The Pennsylvania Power & Light Company has arranged for a bond issue of $7,000,000, the proceeds to be used for the acquisition of electric companies at Williamsport, Montoursville, Lock Haven and vicinity and for extensions and improvements to the power plants and systems. It is proposed to double the capacity of the generating plant at Lock Haven.

ALTOONA, PA. — The Bell Telephone Company, Philadelphia, is planning to erect a business block at Twelfth Avenue and Sixteenth Street, to cost about $1,000,000.

JOHNSTOWN, PA.—The Clarion River Power Company has been granted permission to construct a hydro-electric plant on the Clarion River, near Piney Creek. It will have a capacity of 22,000 hp. and will cost about $300,000, with transmission line.

LANDISBURG, PA.—Arrangements are being made to consolidate the Sherman Valley, Landisburg and Spring Township Electric Companies under the name of the Sherman Valley Electric Company. Extensions will be made to the transmission and distributing lines.

PHILADELPHIA, PA.—The Philadelphia Suburban Gas & Electric Company has arranged for an issue of $400,000 in capital stock, part of the proceeds to be used for extensions and improvements.

PITCAIRN, PA.—The Pennsylvania Railroad Company contemplates the construction of a power house in connection with its proposed new local car shops, to cost about $500,000.

PITTSBURGH, PA.—Contracts have been awarded by the West Power Company for an extension to the Springdale power plant on the Allegheny River, about 15 miles above Pittsburgh, and for other improvements, totaling about $15,000,000. Two turbo-generators of 35,000 kw. each will be installed and a steel-tower transmission line, carrying two 132,000-volt circuits, will be erected from Springdale to Charleroi.

PITTSBURGH, PA.—The Duquesne Light Company contemplates the erection of a new plant at 1305-7 Sarah Street, to cost about $35,000.

WAYNESBORO, PA. — Plans are under consideration to install a new ornamental lighting system on Main Street to replace the cluster lamps now in use. It is proposed to erect forty standards mounted with single lamps.

WILLIAMSPORT, PA.—The Pennsylvania Power & Light Company is reported to have completed arrangements for the purchase of the Williamsport Electric Company, the Lycoming-Edison Company of Williamsport, the Jersey Shore (Pa.) Electric Company and the Jersey Shore (Pa.) Street Railway Company. Plans are under way for extensive additions in the present power plants, with system connection with the purchasing company's lines. The Pennsylvania company has also acquired the Lock Haven Light & Power Company, Lock Haven, and is said to be negotiating for the purchase of the Montgomery and Muncy electric light and power companies.

NORRISVILLE, MD.—The Deer Creek Water & Power Company has been granted permission by the Public Service Commission to extend its transmission line to Norrisville to furnish electrical service here.

WILLIAMSON, W. VA.—The Pond Creek Coal Company, recently organized with a capital stock of $500,000, contemplates the installation of hoisting and mining machinery, power equipment, etc.

CLIFTON FORGE, VA. — Surveys are being made by the Virginia-Western Power Company, Clifton Forge, for a hydro-electric plant on the James River, near Balcony Falls, to cost about $250,000.

NORFOLK, VA. — The Scott Terminal Corporation, 121 Bank Street, contemplates the construction of a power house in connection with proposed piers, warehouses and terminals in the Newton Park section. An ice-manufacturing and cold-storage plant will also be installed.

North Central States

DETROIT, MICH.—Bids will be received by Donaldson & Meier, architects, Penobscot Building, until Oct. 10 for construction of six seminary buildings, power plant, with smokestack, three boilers, feed pumps, incinerator, coal bunkers, etc., on Chicago Boulevard, for the Sacred Heart Seminary. M. J. Gallagher, 1219 Washington Boulevard, is rector.

CINCINNATI, OHIO. — The Chevrolet Motor Car Company, Detroit, will build a power house in connection with its proposed plant to be erected in the Norwood section, to cost about $400,000.

CLEVELAND, OHIO.—Bids will be received by the commissioner of purchases and supplies, City Hall, until Oct. 13 for steam blower equipment. Bids will also be received until Oct. 13 for electric motors.

LORAIN, OHIO.—The Ohio Public Service Company has issued $3,625,600 in capital stock, part of the proceeds to be used for extensions and improvements.

MIDDLEPORT, OHIO.—The Middleport Electric Company is erecting an electric transmission line into the Pomeroy Bend field.

MINERVA, OHIO. — The Owen China Company plans the construction of a power house in connection with its proposed local pottery, to cost $175,000.

LOUISVILLE, KY. — Negotiations are under way between the Board of Public Works and the officials of the Louisville Gas & Electric Company relative to extending the lighting system to the suburbs of the city, including the newly annexed territory. The plans call for ornamental standards maintained by underground wires.

WHICK, KY.—The Noble Coal & Lumber Company, recently organized, will install a power house at its local coal properties.

BLOOMINGTON, IND.—An electric plant and electrically operated pumps will be installed in connection with the proposed new waterworks system, to cost about $1,000,000.

BROAD RIPPLE, IND. — The town of Broad Ripple has applied to the Public Service Commission for permission to issue $10,000 in bonds for the installation of an electric lighting system.

CLINTON, IND. — The Wabash Valley Electric Company contemplates extensions and improvements, to cost about $50,000.

CRAWFORDSVILLE, IND.—Extensions are contemplated to the municipal electric light plant, including the installation of a 3,000-kw. turbine, one service condenser and auxiliary, one 750-hp. water-tube boiler, mechanical stoker, one 35-kw. exciter, one 5,000-hp. heater, one coal-way lorry and piping.

MISHAWAKA, IND.—The Farmers' Light & Power Company, now being organized at Mishawaka to supply electricity for lamps and motors to surrounding farms and outlying farms, has been granted permission by the Board of Public Works to attach feed wires to the Spring Street line. The company will be capitalized at $10,000. Joseph Soens, Victor Shalloi and George Chandler, all of Mishawaka, are incorporators.

OAKLAND, IND. — The White Valley Power Company, a subsidiary of the Indiana Power Company, has acquired the property of the Oakland City Light & Power Company, and which will be merged with its system. Extensions and improvements are planned. Negotiations are under way for the purchase of the system of the Princeton (Ind.) Light & Power Company. A new transmission line will be erected from the Edwardsport central station.

BATAVIA, ILL.—Steps have been taken by the City Council to purchase electricity instead of generating it at the municipal electric power plant.

CHICAGO, ILL. — The Commonwealth Edison Company will erect a one-story substation, 33 ft. x 44 ft., at 50 East Lake Street.

EAST ST. LOUIS, ILL.—The installation of an ornamental lighting system in downtown section of the city, to cost about $27,000, is under consideration by the City Council.

GREEN BAY, WIS. — Bids are being asked by Foeller & Schoeber, Architects, Nicollet Building, for a dairy and power boiler house for the Fairmont Creamery Company, to cost about $60,000.

MILWAUKEE, WIS. — The Milwaukee Electric Railway & Light Company has applied to the Railroad Commission for permission to extend its electric railway on the Port Washington Road from the city limits to Lincoln Park.

STURGEON BAY, WIS.—Plans are under consideration for the installation of an ornamental lighting system in the business district, to cost about $25,000. The plans call for concrete posts mounted with a 400-watt lamp.

CARUTHERSVILLE, MO. — Plans are under consideration by the City Council for rebuilding the municipal electric power plant and ice-manufacturing factory, recently destroyed by fire.

MILAN, MO.—Plans are being prepared for extensions and improvements to the municipal electric plant, to cost about $16,000.

PARIS, MO. — Extensions and improvements to the municipal electric plant are under consideration.

LANGFORD, S. D.—Bonds to the amount of $23,500 have been sold, the proceeds to be used for the construction of a municipal electric light plant.

PIERPONT, S. D.—Bonds to the amount of $17,500 have been issued for the construction of a municipal electric light plant.

STUART, NEB.—Plans have been completed for a municipal electric light and power plant.

Southern States

HENDERSONVILLE, N. C.—Work has begun on the erection of a transmission line into the city under provisions of a franchise granted the Blue Ridge Power Company. The proposed line will extend from the hydro-electric plant of the company on Green River to Hendersonville, a distance of 7 miles.

SOUTHERN PINES, N. C.—The Sandhills Power Company plans to install a lighting system in the Weymouth Heights section.

WINSTON-SALEM, N. C.—The Westover Park Co., Inc., will install an electric lighting system in the Westover Park section. G. F. Hinshaw is engineer.

COLUMBUS, GA.—The Columbus Electric & Power Company has begun work on raising the voltage of its transmission lines between Goat Rock and Newnan. Material, it is understood, has already been purchased. The coat is estimated at $150,000.

NEW SMYRNA, FLA. — The Volusia Cypress Company plans to build a power house at its proposed new lumber mill, to cost about $100,000.

KINGSPORT, TENN.—The Mead Fiber Company contemplates the construction of a power house in connection with proposed plant additions, to cost about $750,000.

GORDO, ALA.—Plans are being prepared for the installation of a municipal electric plant, for which bids will soon be asked.

LITTLE ROCK, ARK.—Plans are being prepared by the Caddo Power & Irrigation Company for the construction of two hydro-electric power plants on the Ouachita River, near Hot Springs. The first plant will be located about 5 miles from the city and will cost about $3,000,000, including equipment. The second station will be located at Blanchard Springs and will cost about $5,000,000. The combined capacity of the two plants will be about 100,000 hp.

FRANKLIN, LA.—The installation of new machinery in the municipal electric plant is under consideration.

COLLINSVILLE, OKLA.—Extensions to the ornamental street-lighting system are under consideration.

DUNCAN, OKLA.—At a special election to be held in October a proposal to issue $800,000 in bonds will be submitted to the voters, of which $200,000 will be used for a municipal electric plant and distributing system.

OILTON, OKLA.—The Oklahoma Gas & Electric Company contemplates extensions to its local power plant.

SAPULPA, OKLA.—Plans are being prepared for the installation of an ornamental lighting system in the business district. Tentative plans provide for eighty lamp standards.

TULSA, OKLA.—The Oklahoma Power Company will double the capacity of its generating plant at West Tulsa.

DALLAS, TEX.—The Dallas Power & Light Company has been authorized by the City Commission to install 250 additional street lamps, to be erected in various parts of the city as needed within the next twelve months.

DEWEYVILLE, TEX. — The Peavy-Moore Lumber Company plans to rebuild its lumber mill and power house, recently destroyed by fire, causing a loss of about $200,000, including equipment.

FORT WORTH, TEX.—An electrically operated pumping plant will be installed in connection with the new sewage-disposal plant to be built by the city at a cost of $750,000.

HOUSTON, TEX.—The Armstrong Steel Company, Fort Worth, plans to build a power plant in connection with its proposed new local mills, to cost about $1,000,000.

TULIA, TEX.—Extensions and improvements to the municipal electric plant are under consideration.

Pacific and Mountain States

SEATTLE, WASH.—The installation of a lighting system on Stewart Street, between Westlake and Eastlake Avenues, has been approved by the Council.

SEATTLE, WASH. — The Puget Sound Power Company has been granted permission by the Federal Power Commission to construct two hydro-electric plants on the Sultan River, including transmission system.

TACOMA, WASH.—The Council has approved the installation of an ornamental lighting system on North Cedar and South G Streets and vicinity.

EUGENE, ORE.—The installation of a third electric generating unit at the municipal electric plant at Walterville is under consideration. The work will include an extension to the power house, widening canal and the installation of a new turbine and generator. The cost is estimated at about $120,000.

EAGLE ROCK, CAL.—Negotiations are under way with the Southern California Edison Company for the installation of a street-lighting system, to cost about $129,000.

FRESNO, CAL.—The Madera Sugar Pine Company is reported to be planning to rebuild its lumber plant, including power house, recently destroyed by fire. The loss estimated at about $1,500,000.

LOS ANGELES, CAL.—The Council has authorized the installation of an ornamental lighting system on Fourteenth and San Pedro Streets, Pacific and Hamilton Avenues and other thoroughfares.

LOS ANGELES, CAL.—The Little Rock Power & Water Company has been granted permission by the Federal Power Commission to construct a hydro-electric plants on Little Rock Creek, to cost about $300,000.

SAN BERNARDINO, CAL.—The Santa Fé Railway Company has awarded a general contract to the Lynch-Cannon Construction Company, Chapman Building, Los Angeles, for the construction of a power house at its local shops, to cost about $80,000.

SAN FRANCISCO, CAL.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Oct. 24 for 100,000 ft. of bell wire for use at the Mare Island Navy Yard. (Schedule 187.)

SAN FRANCISCO, CAL.—The California-Oregon Power Company has been granted permission by the Federal Power Commission to construct hydro-electric plants on the Klamath River to develop 120,000 hp. The cost, including transmission system, is estimated at $7,000,000.

SALT LAKE CITY, UTAH.—The Federal Power Commission has granted the Utah Power & Light Company permission to erect a hydro-electric plant on Bear River, a few miles above its Grace plant. The project includes a dam, 250 ft. long, and a power station equipped with two generating units of 10,500 hp. each. The plant will be connected with the existing transmission system by a 130,000-volt transmission line.

CHANDLER, ARIZ.—The installation of a complete lighting system is under consideration by the Town Council.

PHOENIX, ARIZ. — The Southwestern Portland Cement Company, El Paso, Tex., will build a power plant in connection with its proposed new local cement mill, to cost about $1,000,000.

FROID, MONT.—Plans are under consideration for rebuilding the municipal electric plant, recently destroyed by fire.

HOPE, N. M.—Surveys are being made for the installation of a municipal electric light and power plant and waterworks system. F. L. Hancock, Denver, Col., is consulting engineer.

Canada

EDMONTON, ALTA. — By-laws providing $55,000 for extensions to the municipal electric plant and $250,000 for telephone extensions, it is understood, will soon be submitted to the ratepayers. C. E. K. Cox is city clerk.

NELSON, B. C.—Extensions to the municipal electric light and power system, to cost about $15,000, are under consideration.

CAPREOL, ONT. — The Hydro-Electric Power Commission contemplates developing the rapids in the Vermilion River, north of Green Lake, to supply electricity in Capreol. It is estimated that about 700 hp. can be developed.

STEVENSVILLE, ONT.—The installation of an electric lighting system in Stevensville is under consideration by the Bertie Township Council. J. L. Burgar is engineer.

THOROLD, ONT.—The Town Council has authorized the installation of electric lamps on King Street.

WINDSOR, ONT.—The installation of a combined fire-alarm and police-signal system, to cost about $35,000, is under consideration.

YORK, ONT.—The Township Council is considering the installation of an improved lighting system in the Fairbanks district, for which an estimate of cost will be secured from the Hydro-Electric Power Commission of Ontario.

Electrical Patents

Announced by U. S. Patent Office

(Issued Sept. 19, 1922)

14,457 (reissue). ELECTRIC STORAGE BATTERY; M. Lechner, New York, N. Y. App. for reissue filed Aug. 31, 1921. Plates on supports that prevent short-circuiting with accumulation of sediment.

1,429,217. WARNING SIGNAL; E. Auflero. Brooklyn, N. Y. App. filed June 27, 1921. Motor-operated vibrating horn.

1,429,227. VARIABLE CONDENSER; W. Dubilier, New York, N. Y. App. filed Sept. 28, 1921. Variable condenser combined and operated with fixed condenser.

1,429,240. RADIO SIGNALING SYSTEM; E. C. Hanson, Washington, D. C., and E. T. Jones, New Orleans, La. App. filed Feb. 24, 1920. Underground antenna system.

1,429,241. TELEPHONE SYSTEM; J. F. Hayden, High Point, N. C. App. filed Feb. 12, 1917. Instantaneous disconnect and recall, automatic ringing and listening, etc.

1,429,243. ELECTRIC SIGNALING SYSTEM; S. B. Hess, Jamaica, N. Y. App. filed Jan. 21, 1918. Fire-alarm system for group of buildings.

1,429,247. ELECTRIC LOCK AND ALARM FOR AUTOMOBILES; S. L. Mathews, St. Louis, Mo. App. filed Feb. 26, 1918.

1,429,248. MULTIPLEX SIGNALING SYSTEM; H. S. Osborne, New York, N. Y. App. filed July 28, 1919. Application of carrier currents for transmitting signals.

1,429,261. FLASHLIGHT OR BATTERY HAND LAMP; A. W. Wellington, Waterbury, Conn. App. filed May 14, 1921. Metal cap closing lower end permanently insulated from the battery.

1,429,286. ELECTRIC FURNACE; C. I. Hayes, Edgewood, R. I. App. filed March 2, 1921. Adapted for heat-treating metal articles such as jewelry, etc.

1,429,300. NEGATIVE PLATE FOR ELECTRIC ACCUMULATORS AND THE MANUFACTURE THEREOF; A. Pouchain, Turin, Italy. App. filed June 22, 1920. For reducing electrochemical action on the borders of negative plates.

1,429,329. ATTACHMENT FOR SPARK PLUGS; S. Donaldson, Carnegie, Pa. App. filed April 1, 1921. Spark intensifier.

1,429,330. PROCESS OF RECOVERING ZINC FROM COMPLEX ORES; J. T. Ellsworth, Park City, Utah. App. filed July 12, 1921. By electrolysis.

1,429,369. ATTACHING DEVICE; W. M. Parker, Parkersburg, W. Va. App. filed Jan. 8, 1915. Nail or screw through knobs pinched to prevent separation.

1,429,381. ELECTRICAL APPARATUS; T. W. Varley, New York, N. Y. App. filed July 24, 1918. Voltage control of axle-driven generators.

1,429,397. HAND WARMER; J. C. Barrow, Philadelphia, Pa. App. filed Aug. 13, 1921. Electric heater placed on steering wheels.

1,429,402. ELECTRIC HEATER; A. A. Buck, Zurich, Switzerland. App. filed Aug. 6 1917. Resistance wire interlaced in fabric material.

1,429,438. ELECTROPLATING APPARATUS; F. R. Klaus and H. W. Kranz, Cleveland, Ohio. App. filed Nov. 6, 1919. Single device for cleansing, pickling, plating, washing and drying sheet-metal tire rims.

1,429,441. METHOD OF MAKING ELECTRIC CONDUCTORS; J. Lind, Kansas City, Mo. App. filed April 25, 1921. Aluminum wire insulated by being heated, then quenched in oxiding bath.

1,429,443. THERAPEUTIC DEVICE; H. D. McFaddin, East Orange, N. J. App. filed Feb. 15, 1919. Flexible mounted cluster of lamps for subcutaneous treatment of the body.

1,429,453. INDUCTANCE DEVICE; H. J. Power, Somerville, Mass. App. filed March 11, 1918. Spiral inductance coil for radio work.

1,429,489. ELECTRIC FURNACE; M. S. Clawson, Upper Montclair, N. J. App. filed July 13, 1920. Crucibles secured between pairs of electrodes, each pair connected to one phase of circuit.

1,429,497. METHOD AND APPARATUS FOR DETECTING, MEASURING AND UTILIZING LOW-FREQUENCY IMPULSES; R. A. Fessenden, Brookline, Mass. App. filed June 6, 1917. For detecting submarines.

1,429,572. CIRCUIT RECEIVER; H. J. J. M. de Bellescize, France. App. filed Aug. 14, 1918. Receiver for wireless telegraphy comprising condenser, a closed circuit including a coil and an indicating device.

1,429,601. ELECTRIC POCKET LAMP WITH MECHANICAL ELECTRIC GENERATOR; A. Luzy, Paris, France. App. filed May 7, 1918.

1,429,602. BASE FOR INCANDESCENT LAMPS; F. W. Lyle, Toronto, Ont., Can. App. filed July 15, 1918. Miniature lamp bulb and socket.

1,429,634. TELEPHONIC REPEATER; C. Robinson, Reigate, and R. M. Chamney, London, England. App. filed Nov. 18, 1919. Transformer type comprising two sets of speaking-line windings, an input and an output winding.

1,429,660. THERMAL RELAY; L. E. Warner, Berkeley, Cal. App. filed Feb. 1, 1918. Operated by current generated within the relay.

1,429,668. FIRE-ALARM BOX; R. Zakrzewski and K. Sulek, Thorpe, W. Va. App. filed Oct. 22, 1921. Holds arm of person turning in alarm.

1,429,693. ELECTRIC CLOCK; L. Pillion, Dijon, France. App. filed Aug. 26, 1920. Secondary electric clock comprising a series of rotary prisms on faces of which hours are indicated.

1,429,735. ELECTRIC WATER HEATER; M. W. Hornsby, New York, N. Y. App. filed Feb. 19, 1921. Automatic heater composed of carbon electrodes with water completing circuit.

1,429,799. ELECTRIC HEATER FOR STEERING WHEELS; E. S. Tesdell, Des Moines, Iowa. App. filed Nov. 15, 1920.

1,429,830. STORAGE-BATTERY ELECTROLYTE; R. E. Banks, Washington, D.C. App. filed June 2, 1922. Contains iron, aluminum and copper sulphates, sulphuric acid and water.

1,429,840. DAMPING DEVICE FOR ELECTRICAL INSTRUMENTS; H. B. Brown, Rochester, N. Y. App. filed Nov. 16, 1921. Magnet coil automatically short-circuiting when instrument is handled.

1,429,858. RHEOSTAT; E. C. Fasoldt, Albany, N. Y. App. filed April 7, 1922. Vacuum-tube-filament rheostat.

1,429,865. PRESSING MACHINE; S. Friedman, Atlanta, Ga. App. filed April 8, 1920. Water pipe in pressing boards surrounded by heating coils.

1,429,880. CREASING IRON; F. G. Hofmann, New York, N. Y. App. filed April 2, 1921. Iron electrically heated for marking grooves on leather articles.

1,429,898. ELECTRIC HEATER; B. W. Macy, Jacksonville, Fla. App. filed Nov. 6, 1920. Resistance coil placed in fat for frying doughnuts, etc.